THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXIX., No. 16. Whole No. 1,741. | NEW YORK, MONDAY, OCTOBER 19, 1908. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. | THOMAS J. CUNNINGHAM, ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

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[OFFICIAL NOTICE.]

Third Annual Meeting, American Gas Institute.

AMERICAN GAS INSTITUTE HEADQUARTERS,
25-29 WEST 39TH ST., NEW YORK CITY, Oct. 5, 1908.

GENERAL ANNOUNCEMENT.

The third annual meeting of the American Gas Institute will be held at New York, N. Y., October 21st, 22d and 23d, 1908. The meeting will be called to order by the President, Alex. C. Humphreys, of New York, at 10 A.M., Wednesday, October 21st.

Meeting Hall and Headquarters.—The business sessions will be held in the Auditorium of the United Engineering Societies' Building, 29 West 39th street, between Fifth and Sixth avenues. The Auditorium is on the third floor of the building, and on the eighth floor are located the permanent headquarters of the Institute. On the days of meeting the Secretary and Treasurer's office at headquarters will be open from 9 A.M. to 6 P.M. When the Institute is not in session the President and officers will make their headquarters at the Hotel Astor, Times Square (Broadway and 44th street).

Members are particularly urged to write for their rooms at once and, in doing so, a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted. The securing of rooms well in advance is important, as the hotels are liable to be well filled at this time of the year.

Roll Call.—The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will, at the door, receive a special card upon which he will find his name, address, etc., as these appear in the Secretary's books, and such card should be corrected and returned to those in charge. Members should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

The following list of hotels with rates is submitted:

Hotel.	Location.	Single Room.		Double Room.	
		Without Bath.	With Bath.	Without Bath.	With Bath.
Breslin	B'way, cor. 29th st.	$1.50	$2.50	$3.00	$4.00 up.
Gilsey	" " "	1.50	2.50	2.50	3.50 "
Imperial	" and 32d st	2.00	2.50	4.00	5.00 "
Martinique	" " 33d st.	2.00	2.50	3.50	3.50 "
Herald Square	" " 34th st.	1.50	2.00	2.50	3.00 "
Marlborough	" 36th and 37th st.	1.50	2.50	2.50	3.00 "
Knickerbocker	" at 42d st	2.00	3.00	....	5.00 "
*Astor	Times Square	2.50	3.50	3.50	4.50 "
Manhattan	42d st. & Madison ave.	2.00	3.00	4.00	5.00 "
Belmont	" " " Park ave.	2.50	3.50	4.00	5.00 "
Grand Union	" " " "	1.00	2.50	2.00	3.50 "
Holland	5th ave. and 30th st	2.00	3.50	3.00	4.50 "
Waldorf	" " " 34th st.	3.00	4.00	5.00	6.00 "
Savoy	" " 58th & 59th st.	2.50	3.00	3.50	4.50 "
Netherlands	" " and 59th st	2.00	3.00	....	5.00 "
Prince George	14 East 28th street.	....	2.00	....	3.00 "

* The banquet will be served at the Hotel Astor on Thursday evening, October 22d.

The above prices are all minimum rates for one person in a room, European plan. Rates for two persons in one room may be obtained by communicating with whichever hotel may be selected.

Badges.—All members attending the meeting are particularly requested to bring their membership badges, as the Committee of Arrangements is preparing an identification badge for each member which will require the regular membership badge for its proper completion.

LIST OF PAPERS AND REPORTS.

The papers and reports to be read at the meeting are as follows:

List of Papers.

"High Pressure Distribution;" by Mr. Jacob D. von Maur, St. Louis, Mo.

"Benzol Enrichment;" by Mr. E. H. Earnshaw, Newark, N. J.

"Some Further Remarks on the Photometry of Gas;" by Mr. Chas. O. Bond, Philadelphia.

"Physical Theory of Coal Carbonization;" by Mr. W. H. Fulweiler, Philadelphia.

"Vertical Retorts;" by Mr. J. H. Taussig, Philadelphia.

"Relative Merits of Wrought Iron and Steel Pipe;" by Mr. Frank N. Speller, Pittsburgh.

"Report of Progress on 'A' Meters;" by Mr. W. J. Serrill, Phila.

"Report of Progress on Dipping Meters;" by Mr. W. A. Castor, Philadelphia.

"Holder Cups and Tank Heating;" by Mr. C. J. Ramsburg, Phila.

"Better Gas Illumination;" by Mr. Thomas J. Litle, Gloucester, N. J.

General Reports.

Report of the Public Relations Committee; Mr. E. G. Cowdery, Chicago, Chairman.

Report of Technical Committee; Mr. W. H. Gartley, Philadelphia, Chairman.

Report of Board of Revision of the Question Box on the Manufacture of Gas; Mr. J. D. Shattuck, Chester, Chairman.

Wrinkles; Mr. M. R. Bump, Editor, New York.

Accidents; Details by Members.

Special Reports of the Sub-Committees of the Technical Committee.

Report of Committee on Calorimetry, Mr. [illegible] Brown, Milwaukee Chairman.

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Report of Committee on Uniform System of Accounting, Mr. R. A. Carter, New York, Chairman.

Report of Committee on Pipe Standards, Mr. A. S. Miller, Baltimore, Chairman.

Report of Committee on Electrolysis, Mr. A. G. Glasgow, London, Chairman.

Report of Committee on Unit of Light, Mr. W. H. Gartley, Philadelphia, Chairman.

Report of Bureau of Information, Mr. W. A. Baehr, St. Louis, Chairman.

Report of Proceedings of International Committee for Standardization of Threads for Gas Appliances, Mr. A. G. Glasgow, London, Delegate.

Announcement.—Sight-seeing Trip to Consolidated Gas Company's Plant, by Mr. W. C. Morris, New York.

Note.—In order that the Proceedings containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving New York. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all reports will be turned in to the Publication Committee and thence to the printer immediately after the adjournment of the meeting.

Transportation.

Special rates for transportation have been granted (viz., full fare going and three-fifths fare returning by the same route) by the several Passenger Associations named and under the conditions noted.

The Trunk Line Association, covering the territory west of New England and east of and including Niagara Falls, Buffalo and Salamanca, N. Y.; Pittsburgh, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east, by Pittsburgh, Salamanca, Buffalo and Toronto; on the north, by Lakes Erie, Huron and Michigan to the north line of Cook county, Ills.; on the west, by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of the river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias, and south and east of the Ohio and Mississippi rivers, and the Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis—in other words, the territory west of that of the Central Association—have refused to grant the rate, the former because of the small amount of travel to the meeting originating in its territory, and the latter because the fares to Chicago, Peoria and St. Louis from a large part of their territory are now on the basis of 2 cents per mile, so that members attending the meeting, who purchase tickets from the starting point to the nearest point in the territory of the Central Passenger Association and then buy tickets from that point to New York at the reduced fare, secure practically the same rates as far as the territory of the Western Association is concerned as would have been obtained under the old conditions with a rate of fare and one-third.

Members starting from territory in which the rates have not been granted should buy tickets from starting point to the nearest, or most convenient, point in the territory of any of the Associations granting the reduced rate, and at such point purchase tickets through to New York and obtain a certificate.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations:

1. The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates, obtained from ticket agents at starting points, showing payment of full first-class fare of not less than 75 cents through to place of meeting.

2. Each person, to obtain the excursion rate, must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates. If, however, the ticket agent at a local station is not supplied with certificates and through tickets to place of meeting, he can inform the delegate of the nearest important station where they can be obtained. In such case the delegate should purchase a local ticket to such station and there secure certificate and through ticket to place of meeting.

3. If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through tickets can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

4. Tickets for the return journey will be sold by the ticket agent at the place of meeting at three-fifths the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Assistant Secretary of the Institute, certifying that the holder has been in regular attendance at the meeting.

5. No reduction of fare will be made on the return passage, if the going ticket is purchased more than three days before the opening date of the meeting; except that when meetings are held at distant points, to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

6. Certificates must be given to Mr. West Bissell, Assistant Secretary, at the New York headquarters, together with 25 cents for each certificate, this being the fee charged by the railroads for the services of their special agent. After the certificate has received the proper indorsement and the vise of the special agent it will be returned to you.

7. Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

8. The certificate of agent at starting point, duly indorsed by the Assistant Secretary of the Institute, must be presented to ticket agent at place of meeting within three days (Sunday not reckoned) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

9. No refund of fare will be made on account of any person failing to obtain a certificate.

Entertainment and Hours of Meeting.

Wednesday, October 21.—The business sessions will be from 10 A.M. to 12:30 P.M., and from 2 P.M. to 5 P.M. The evening will be at the disposal of the members, no entertainment having been arranged for Wednesday.

Thursday, October 22.—Business session from 10 A.M. to 2 P.M. Remainder of afternoon at the disposal of members. Tickets of admission will be given to those who desire to visit the gas and electric stations in and around the city. The banquet for members and guests will be held at the Hotel Astor at 6:30 or 7 P.M. This hotel is noted for its excellent service, and it is the desire and expectation of the Committee to make this a most attractive feature, both as regards the quality of the dinner and the speaking afterward. Arrangements have been made for the ladies to attend the performance at the Hippodrome on Thursday evening, this entertainment being both unusual and interesting, in fact, the only one of its kind.

Friday, October 23—Business session from 10 A.M. to 12:30 P.M. After adjournment members are invited to inspect the plant of the Astoria Light, Heat and Power Company. Luncheon will be served on the steamer while making the trip from Manhattan to Astoria. The return trip will be made in time for members to dine at their respective hotels.

Luncheon for the ladies will be served at the Hotel Astor, followed by an automobile trip around New York, giving them an opportunity to see many points of interest. The automobiles will start from the Hotel Astor at 2 P.M. Friday evening will be at the disposal of the members.

Saturday, October 24.—The Committee has arranged an excursion up the Hudson to West Point for members, ladies and guests. Luncheon will be served on the special steamer "Sagamore," which has been chartered for the occasion. In addition to the other interesting features at West Point, there will be a dress parade of the cadets. Returning, the steamer will reach New York in time for dinner. The Committee will endeavor to so arrange that parties desiring to continue west on their homeward trip may do so from West Point by train either on the West Shore Railroad or on the New York Central Railroad.

Tickets for Entertainment.—$5 for ticket to banquet; $5 for ticket for excursion, which includes: A ticket to West Point and return, including luncheon for member with complimentary ticket for one lady guest. One ticket to Hippodrome; one ticket for automobile trip around New York; one ticket for ladies' luncheon, for use of member's lady guest only; $5 for extra guest ticket, which includes: one ticket to West Point and return, including luncheon; one ticket to Hippodrome; one ticket for automobile trip around New York; one ticket for ladies' luncheon (for the use of a lady guest only).

By invitation of the Consolidated Gas Company, transportation to Astoria, including luncheon, will be furnished to members only, on application to the Treasurer of the Committee on Arrangements, Mr. W. Cullen Morris.

Separate extra tickets for the Hippodrome can be obtained only from the Chairman of the Reception Committee, Mr. C. H. Dickey. Separate extra tickets for the automobile trip around New York can be obtained only from the Chairman of the Reception Committee, Mr. C. H. Dickey. Complimentary tickets of admission to the gas and electric stations in and around the city will be furnished to members on application to the Treasurer of the Committee on Arrangements, Mr. W. Cullen Morris. These tickets, when presented at the various stations, *must* be accompanied by the regular Membership Badge for the purpose of identification.

Special Notes.

Please fill out the inclosed stamped and addressed postal card and mail *at once.* This will materially aid the Committee of Arrangements and prompt replies will be much appreciated.

Be sure to obtain a railroad certificate when buying your ticket to New York. The greater the number of certificates handed in, the easier it is to obtain the reduction in rates for future meetings, since the railroad officials count the certificates turned in as marking the full attendance. Apply for ticket and certificate at least 30 minutes before train time. Each person must sign his own certificate at time of purchasing tickets to New York. Members will please hand the

Assistant Secretary their certificates, accompanied by 25 cents for each one, upon arrival at Headquarters. If there are 100 members present holding certificates, each certificate will then be promptly indorsed and held at the Institute Headquarters where members should call for them. Apply for return tickets at least 30 minutes before train time and have your certificates with you. All persons, ladies included, attending the meeting are entitled to the reduced rate from the territories named. Keep this circular in your pocket and apply to it if in doubt. ALEX. C. HUMPHREYS, President.

Extract from the Constitution.—Sec. 19. A member whose dues for a year completely expired are not paid, shall not be entitled to vote, nor to participate in the deliberations of the Institute, nor to receive a copy of the Proceedings. Any member whose dues shall remain unpaid for a term of 3 years may be dropped from the roll of membership by a vote of the Directors. A member dropped for nonpayment of dues may, upon paying the amount he owes the Institute, be reinstated at the option of the Directors.

BRIEFLY TOLD.

DEATH OF SIR GEORGE LIVESEY.—Just before going to press the European mail to hand held copies of the *Journal of Gas Lighting*, which contained the announcement of the death, at his residence, "Shagbrook," Reigate, England, the morning of the 4th inst., after an illness that caused his taking to bed some 4 days earlier. He was in his 75th year, having been born in Islington, England, April 8, 1834. Easily the dean of the gas profession, his name and fame will live while the industry lasts.

THIRD ANNUAL MEETING, AMERICAN GAS INSTITUTE.—It need not in any particular sense be said that the officers of the American Gas Institute have been quite up to the duties put upon them of preparing for the Third Annual Meeting of the Institute, which will be held here this week. Even the most hurried reader, who looked over the notices respecting it, as published from time to time in our columns, could readily see that the work had been well done; but even so, a a line or more calling attention to a seemingly self-evident fact is not amiss. Everything that possibly could have been done in advance to insure the success of the meeting, from any and every point of view, has been done. The Committee of Arrangements has had its work cut out for it, but the Business Chief and the Engineering Chief—Messrs. Addicks and Bradley—were quite up to the tasks imposed, even though the staffs of each had to put in "some extra time." Given weather such as was our major portion last week, the attendance, and the benefit to be derived from attending, will be a record breaker in the annals of gas association meetings; but, good weather or not, it is a certainty that all attendance records will be shattered. The order of business, as promulgated this week, is as follows:

Wednesday Morning—

(1) Report of Public Relations Committee; Mr. E. G. Cowdery, Chairman.

(2) Report of Technical Committee; Mr. W. H. Gartley, Chairman.

(3) Report of Committee on Uniform System of Accounting; Mr. R. A. Carter, Chairman.

(4) Report of Progress on Dipping Meters; Mr. W. A. Castor.

(5) Wrinkles; Edited by Mr. Milan R. Bump.

Wednesday Afternoon—

(1) High Pressure Gas Distribution; Mr. Jacob D. von Maur, St. Louis Mo.

(2) Benzol Enrichment; Mr. E. H. Earnshaw, Newark, N. J.

(3) Relative Merits of Wrought Iron and Steel Pipes; Mr. Frank N. Speller, Pittsburgh, Pa.

(4) Report of Committee on Pipe Standards; Mr. A. S. Miller, Chairman.

(5) Report of Committee on Electrolysis; Mr. A. G. Glasgow, Chairman.

Thursday—

(1) Report of Committee on Calorimetry; Mr. R. B. Brown, Chairman.

(2) Some Further Remarks on the Photometry of Gas; Mr. C. O. Bond, Philadelphia, Pa.

(3) Report of Committee on Unit of Light; Mr. W. H. Gartley, Chairman.

(4) Better Gas Illumination; Mr. Thomas J. Litle, Gloucester, N.J.

(5) Physical Theory of Coal Carbonization; Mr. W. H. Tutweiler, Philadelphia, Pa.

(6) Vertical Retorts; Mr. J. H. Taussig, Philadelphia, Pa.

(7) Holder Cups and Tank Heating; by Mr. C. J. Ramsburg, Philadelphia, Pa.

(8) Report of Proceedings, International Committee for Standardization of Threads for Gas Appliances; Mr. A. G. Glasgow, Delegate.

Friday—

(1) Report of Bureau of Information; Mr. W. A. Baehr, Chairman.

(2) Report of Board of Revision of Question Box on the Manufacture of Gas; Mr. J. D. Shattuck, Chairman.

(3) Accidents; Details by Members.

(4) Sight-seeing Trip to Consolidated Gas Company's Plant; by Mr. W. C. Morris.

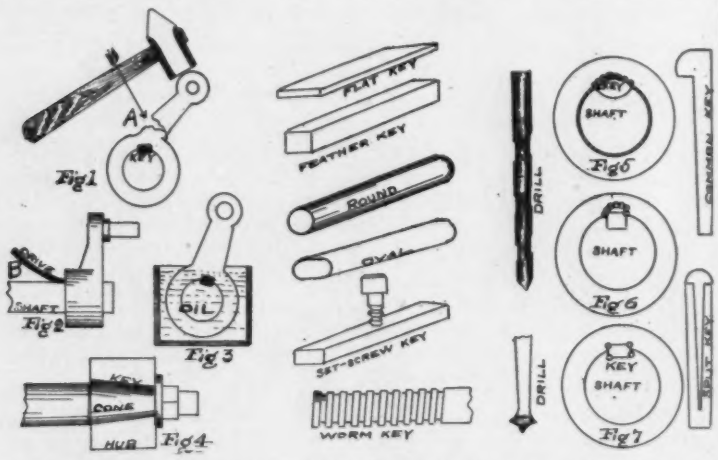
FIRST MEETING, GAS POWER SECTION, AMERICAN SOCIETY MECHANICAL ENGINEERS.—The initial meeting of the gas power Section of The American Society of Mechanical Engineers was held in the Engineering Societies Building, New York, the evening of the 13th inst., and the interest evinced therein and attendance present thereat presage a successful future for the Section. In the unavoidable absence of our well-known friend, Mr. Henry L. Doherty, the duties of Chairman devolved upon Dr. Lucke, through whose well-directed efforts a large part of the success of the meeting was undoubtedly due. The gas interests were further ably represented, however, by the presence of Messrs. Mayers, Woollen, Bump and Klumpp. The first business of the meeting was a discussion of a communication or report from the Chairman of the Meetings' Committee, Mr. H. L. Doherty. This report outlined a tentative plan for future work, and it will stand along with many similar efforts of its author as a splendid guide for effective work. The members who discussed the matter had much to say in praise and but little in way of criticism. Several members took it upon themselves to discuss various phases of gas producer and gas engine practice, but it was of such diverse character as to remind one of the gas itself. The name of some of the speakers are: Messrs. Tate, Rushmore, Bump, Reeve, Lucke and Wilkins. The importance of one feature of the report on "Unnecessary Duplication of Work," was made very evident before the evening closed, and perhaps an advisory staff of actual gas men, such as will meet in the same building next week, could put some of them aright upon some of the basic principles of gas manufacture. Mr. Doherty very naturally proposed a Bureau of Information, such as we have in the Gas Institute, and if the work being done by the present branch of the latter body be any criterion, it should prove of immeasurable advantage to the new Section. Another valuable method of securing information was through the medium of a "Wrinkle Department," with which your readers are all familiar, Only one speaker, Dr. Lucke, referred forcibly to the necesity of procuring exact scientific data. The next matter considered was a report of the Committee on Standardization, the particular topic being the correct formula to be used to represent the efficiency of a gas producer plant and its engine equipment, but nothing definite was deduced. Two papers were presented, the first affording a description of three bituminous producer plants. The author, Mr. Elbert W. Harvey, discussed the various merits of the apparatus employed, and the members of the Practical Class of the Institute will be interested to learn that a water seal can be used very successfully upon a dry scrubber! As to how well it does its work, or whether it accomplishes any valuable results at all, the author did not state. None of the plants described were equipped with any apparatus to determine the calorific value of the gas, or even an approximation of its constituents; and the discussion did not bring out as to whether these were important accessories to successful operation. The matters brought out in the discussion by Messrs. Tate, Barker and Bibbins, were along the lines of cost, rather than those of operation. After the author of the paper had compared the efficiency of one of his gas producers against a steam plant, he had to admit that the steam plant was neither efficiently made nor suitably equipped for comparison!! As the discussion can readily be omitted the paper will undoubtedly prove a very satisfactory bulletin to be published by his concern? In that the discussion was somewhat lengthy, the second paper, "Loss of Fuel Weight in a Freshly Charged Producer," by Mr. N. T. Harrington, was neither read nor discussed, but accepted as presented. The meeting adjourned shortly after 10:30.—O.

Gas Shop Talks: Removing Refractory Keys.

By "R."

Often the keys which are used to hold certain parts in position on gas working machinery have to be removed. Sometimes, in an effort to release the key from the seat in which it has rusted for a number of years, the crank or other portion held in place is broken off with a hammer, as at *A*, Fig. 1. Sometimes an effort is made to free the stubborn key by igniting a deluge of oil about the combination. I have seen men place the shaft and connected part in the forge, heating the metal until expansion and contraction work out in various ways with a view of releasing the fixed key. Then again, men will chip at a key for hours until they either chip it off or loosen it sufficiently to allow it to be driven out. Some men will get impatient and seriously damage the parts in an effort to release the steel key. In the attached illustrations are set forth a number of methods utilized in various gas works for removing keys from tight seats. One of the first considerations we should give the fixed key is whether or not there is a space at the back by which the key may be driven through. If so, the problem is greatly simplified, unless the key has become more securely fixed than ordinarily. Hence we should possess a number of different sizes of key drives, calculated to place against the inner end of the key to drive, as at *B*, Fig. 2. But it must be remembered that the key is almost always made of steel, and a steel key has wonderful gripping power when properly driven into a clear cut seat. The keyway has a tendency to bind on the edges of the key with considerable severity. Consequently when a steel key is once set it can be depended upon to retain its grip quite indefinitely.

There are occasions when it is possible to saturate the key with its fastening devices, hub and adjusted part with oil for impregnation,



as in the retort, Fig. 3. This can be done only when the fixed parts are on the end of a shaft, or so located that the retort can be used to contain the impregnating oil to the depth needed to saturate the key and surrounding parts. Kerosene oil can be used with good results. After a few hours of saturation, often the gummed and rusted surfaces of the key and seat are opened and the key may be withdrawn. In combinations in which the key fits to a cone shaped end, as in Fig. 4, it is easy to remove the key by, first, unscrewing the clamping nut, then the hub or flanged section may be removed and the key lifted out. Still there are cases of stubborn keys that come up in the engine room, the shafting of the gas plant, the machinery of the building and elsewhere, that create considerable annoyance at times. In one instance an oval key having been driven very tightly into the shaft and collar of an engine shaft in a gas works, where it became necessary to remove the collar in order to slip a gear over the shaft.

An entire department of the works was idle and the employees were losing time. One of the machinists saw that something had to be done in order to release the tight key and he proceeded, as shown in Fig. 5. He obtained a drilling outfit with which he cut a row of holes along the line of the oval key. Hence, as soon as the holes were made in the cast iron collar, the key was freed in its seat and was easily slipped out. To bore a number of holes through a collar like this need not destroy the collar for further use. For illustration, in Fig. 6 we show how a certain tight, square or feather key was removed. A number of holes were drilled through the collar just over the key. Then the key was removed and the collar slipped off. Next the part of the collar which had been bored through was shaped out square with a square file, and when the key was next put in it was made to conform to the increased size of the seat.

Fig. 7 shows how a party removed a key from the end of a shaft, by drilling a hole into the work at each corner of the key. Both the collar and the shaft were cut this time. As soon as the key was released by the corner holes the key was readily withdrawn. Some men are careless, and when they drive a key they do not take into consideration that some day they may want to draw the key. There should be sufficient head on a key to allow an opportunity to use a cold chisel on it in case the key has to be removed. In some cases split keys are employed. Hence, when the wedge is withdrawn the sides contract and the key can be removed easily.

The next diagrams show a number of different designs of keys in use. There are the flat key, the feather or square key, the round key, the oval-shaped key, and the key which depends upon the point of a set-screw to hold the key in position. Finally there is the worm or threaded key. This key, of course, requires that the key seat be similarly cut with threads.

Modern Methods of Heating.

[A paper prepared by MR. H. R. BASFORD for the Santa Cruz Convention, Pacific Coast Gas Association.]

Mr. President and members of the Pacific Coast Gas Association: In appearing before you to-day I feel that an unusual opportunity has been presented to me, and of my appreciation and deep gratitude I will have you all believe. My remarks will distinctly travel along the commercial side of the gas business. In elucidating the facts concerning automatic gas water heating devices, I will confine my remarks to a recital of historic facts in connection with this universal line, performances, and consequent bearing upon the commercial side of the gas industry.

The "Instantaneous Automatic Water Heater" had its birth in Pittsburgh, Pa. Some 20 years ago, when natural gas was first commercially applied, it created a very wide field for all manner of gas consuming devices, and inventors naturally sought to take advantage of the situation in the perfecting of numerous and diverse appliances for all manner of domestic and industrial applications of this cheap and abundant fuel. So it was that in 1887-89 that Mr. Edwin Ruud became identified with Mr. George Westinghouse in the Fuel Gas and Manufacturing Company. The primary object of this Company was to search means and ways whereby it would be possible to produce a fuel gas at a moderate price, and, in conjuntion with these experiments, the development and perfection of all manner of domestic and industrial gas consuming appliances.

At the time mentioned a satisfactory, dependable hot water service for the modern home was well nigh impossible, and if at all obtainable was only at great expense and through the medium of crude and troublesome devices. Naturally this field was very broad and inventors were quick to seek a newer and highly improved method of satisfying the rapidly increasing demands made upon them by a general desire for higher refinement in the home.

After careful and elaborate experiments the application of a thermostat to a gas water heating device was first accomplished. The product at this time consisted of a tubular boiler, and the fuel was controlled by the thermostat through the temperature of the water. While the construction was very crude, the heater was very efficient though expensive, and while it satisfactorily fulfilled its object, its field was narrowed by the first cost. When this became evident and the sale of heaters was restricted from these causes, the thermostat was successfully applied in connection with a continuous copper-coil heater. The early types were of the same general construction as the present heater, so far as the application of the principles is concerned. The well-known staggered coil was brought out, the thermostat being located in the heat zone at the bottom end of the coil. This principle has been religiously adhered to ever since, and to this in no small measure is due the phenomenal success of the automatic gas water heater. This new type, being considerably less in first cost, and possessing a higher efficiency, rapidly won its way in the natural gas field, but quite a few years elapsed before any concerted effort was made to apply this construction to manufactured gas. Improvement and further refinement of the principle went on, however. Experience brought out each difficulty and the inventor's skill overcame them, with the result that, in the year 1902, the first automatic gas water heater for manufactured gas was perfected and made ready for the market.

In the short space of 6 years the then comparatively unknown device has grown to be a byword in tens-of-thousands of homes in the United States, has overcome the first prejudices of the gas man, and

has come to revolutionize the present standard of living so far as economical and satisfactory hot water service for the household is concerned.

We have now sketched the interesting and phenomenal growth of the automatic heater, and shall now dilate upon it as we see it to-day, its service to the user, its value to the gas company, and the breadth and extent to which the first mechanical principles of the heater have been broadened and circumvented the entire field of water heating in all its branches. We are all familiar with the development of the gas range, the telephone and electricity. Each has fought and won the prejudices and skepticisms of its age, and to-day there is not one of us but what accepts each as a reality and indispensable to modern home living.

The automatic heater, like every other revolutionary force, has just about overcome the prejudices and skepticisms of its age, and to-day is accepted as a necessity in the modern home. To a thorough understanding of this remarkable heater, and appreciation of its qualities we must now undertake its analysis.

Fundamentally, a water heater is a combination of three essentials, so corelated as to produce certain results, and yet maintain a consistent relation to one and the other and the whole. The essentials of an automatic water heater are a burner, or a battery of burners, heating surfaces and an automatic controlling mechanism. The many details that relate to these principles are insignificant in the abstract. Taking the several principles in the order mentioned, we will trace the evolution of the Ruud gas burner. We hardly need remark that the development and perfection of a successful gas burner to meet the exacting requirements of an automatic water heater were undoubtedly the most difficult problems to overcome. The burners are all of the Bunsen type, having a construction differing widely from any heretofore produced. There are several types of these burners, all more or less successful. Many different ones have been tried, but it is the general practice now to use a burner from which the flame burns straight off the top. The burners are made with two plates separated, but held together by brass bolts. Between the pieces is placed a perforated copper plate, which is used as a flame check. The flame starts from the corrugations, running along the top of the burner. The peculiar construction prevents, to an infinitesimal part, the possibility of condensation entering the burner proper and causing any stoppage in the perforations of the flame check; and, bear in mind, that no successful burner for an automatic water heater is possible without this flame check. The flames as they start from the burner are inclined inward, thus confining the flame to the center of the coil, which is in turn deflected by deflecting plates held in the coil

The construction and manner of placing the burners allow good circulation of air around the same, thus keeping its temperature at the lowest possible point. The burners are arranged in a battery, on a circular ring, and when in operation produce a continuous sheet of flame without one impinging against the other.

There are some variations in the burner which are now and then found necessary to handle various gases, and this is accomplished by the adjustment of the gas orifice and the perforated copper flame check. Some of these burners have been brought to such a high state of perfection that it is possible to operate one continuously for hours without any fear of back firing.

The next step is the material employed for heating surfaces and their arrangement. The staggered, double, cone-shaped copper coil, wound in series, has been so successful that it is now recognized as the only means of arranging the heating surfaces to obtain satisfactory efficiency. The copper tubing is obtained in suitable regular lengths, in accordance to the footage that may be placed in any one size. As an illustration, will mention the No. 4, which contains 100 lineal feet of seamless copper tubing, consisting of four 25-foot lengths. These lengths are first coiled up into double cones, then brazed together. The inside diameter of the smallest coil is about 6 inches. This space is occupied by a cast iron deflecting plate, which prevents any center draft on flame, and has a tendency to distribute the flame over the surfaces successively exposed above.

The material employed is seamless, cold-drawn copper tubing made from the purest copper obtainable, and tested to withstand a hydrostatic pressure of 1,000 pounds. The automatic mechanism might be called the brains of a water heater. It is upon this part that we must depend for reliable response to the opening and closing of the faucet.

The mechanism of the heater is made in duplex, consisting of a simple upper gas valve, which is controlled entirely by the water pressure valve, and a second gas valve which is controlled entirely by the temperature of the water.

The water valve is so devised that, when you open any hot water faucet in the house, the pressure of the water passing through same will cause an opposite gas valve to be opened. The construction of the water valve is such that it can be applied universally to any and all pressures and kinds of water, and be relied upon to fulfill its function.

Even though this valve has now been perfected, it is still recognized to be subject to certain influences impossible to guard against, the likelihood of gravel or other foreign substances passing into same, and possibly destroying temporarily its function. A water heater depending entirely on a pressure water valve for its control is a marketable impossibility, since it cannot be said to be reliable, but a water heater possessing an internal thermostat operating in conjunction with a water valve can be called absolutely perfect, since it is able to take care of itself under any and all circumstances. The employment of the natural law of contraction and expansion of metals under change of temperature is manifest in the construction of the thermostat. This device is nothing more than a piece of copper pipe, which is employed on account of its sensitiveness to change of temperature. The thermostat tube is connected solid into what is termed the "water head." Within the copper tube is a porcelain rod, which acts as a motion piece, communicating the action of the copper expansion tube to the levers opening and closing the gas valve. Surrounding the copper tube is a 1¼-inch brass jacket through which the water passes. The water enters the heater at the top, travels downward the entire length of the coil, and thence across the fire through the thermostat jacket. Thus you will see that the copper tube is at all times submerged in the water while flowing or still, and that this brass jacket is exposed to the flame from the burners. We will now assume that the heater is in operation, and as the water in the coils heats up the thermostat tube begins to expand, under the increasing temperature, and will continue to expand until the flowing water has reached a predetermined temperature, when the flow of gas will be reduced, and possibly shut of altogether. If we increase the flow of water through the heater, or continue to draw the same amount as we did at the start, the water removed from the coil will be replaced with colder water, and the thermostat tube will be chilled and contract, which will result in the thermostatic gas valve being opened, gradually emitting the full flow of gas. This process continues intermittently while the heater is in operation. Here we see that it is impossible to burn any more gas than is actually required to heat the amount of water drawn to a predetermined temperature. We have an even temperature in the water we are drawing, and should the water valve for any reason be hung up we see how the heater will take care of itself, because the thermostat, being exposed to the flame, will allow the heater to burn only long enough to increase the temperature surrounding thermostat to cause it to expand and close off the valve through which the gas passes to the burners. This arrangement, as will be seen by the process of reasoning above mentioned, positively insures reliable action under any and all circumstances.

We have analyzed in an extended way the successful and fundamental features of an instantaneous automatic gas water heater. Many details, more or less unique in their way and of considerable importance to the three principles discussed, might be touched upon, but do not lend themselves to comprehensible discussion.

The development and success of the instantaneous automatic water heater soon inspired inventors to broaden the field of operation and endeavor to supply the gas fraternity with that long sought for means whereby they could successfully enter the larger field of gas water heating. Within the short space of two years prior to this date a satisfactory gas storage water heater was not obtainable in the market, with the result that many large residences, apartment buildings, gymnasiums, hotels and many other classes of special institutions, were beyond the reach of the gas man, and he suffered to see this rich field in the exclusive control of the coal king. With the invention of certain mechanical devices all this has now been changed, and, through the medium of the multi-coil storage system, we have at one stroke made it possible for the gas company to successfully seek contracts for heating water in any and every class of building, diverting to our coffers a large revenue that heretofore was not thought obtainable.

Having developed a successful burner, one that could be depended upon for continuous firing, there was evolved the well known multi-coil construction of the heating surfaces. With this combination we had a perfect circulating storage water heater, but as the means for automatically controlling the fuel in such a manner as to give the burners the greatest relief, there was invented a marvelously effective and ingenious mechanism. By this valve it was made possible to

eliminate the great heat losses that took place from radiation and convection and brought within a moderate operating cost an automatic gas storage system.

We will give a brief description of the operation of the system. Storage tanks of any given size are installed with single heaters or in duplex, and in very large installations the capacity is expanded to three and sometimes to four. The thermostatic moment valve is installed in the tank and responds to the temperatures of the water in the tank. The heaters now going into operation will work continuously until the tank is filled with water to a predetermined temperature, as arranged by the adjustment of the thermostat. When this temperature is arrived at the moment valve, automatically, and by a snap action, closes off the full supply of gas to the heaters, and circulation then ceases in the coils of the heater, thus eliminating the extremely high losses from radiation and convection. The tank being thoroughly insulated the heat losses are practically nil, and, during the long periods when water is not drawn, no gas is burned in the heaters.

During such times when water is drawn, possibly one-third may be taken from the tank before the temperature of the whole has been so altered as to cause the moment valve to turn on the supply of gas, this valve being so devised that it operates within a range of 25°. The operation repeats itself.

We can point to numerous installations in large residences, flat buildings, hotels and many other special classes of buildings, which under any other circumstances would not be possible gas consumers for water heating. This new system has accomplished and made complete the facilities of the gas company for enjoying the larger revenue that comes from supplying this appliance for large operations.

While we could quote at length many large installations, we take great pride in mentioning one especially, the largest that has heretofore been undertaken. Chicago has under way the construction of numerous public bathhouses, and it is devised to use gas for heating the water. In these bathhouses multi-coil storage systems are employed, the installations each being of 1,500 gallons boiler capacity, fitted with three, 500-gallon per hour multi-coil storage heaters. Considering the very heavy consumption of water that will take place, I leave to your own judgment the revenue that likely accrues to the gas company from these installations, and it must be your inevitable thought that in the perfection of this storage water heating plant a great advance has been made, which will be of ultimate great service to everyone interested in the commercial side of this fascinating industry.

House heating by manufactured gas on any extended scale has heretofore been well nigh impossible. It may surprise some of you to know that the multi-coil, hot water house heater, which is an elaboration of the multi-coil storage heater, for more than the past year has been successfully applied in the field of heating houses by hot water circulation, using manufactured gas as fuel. This type will wonderfully extend the scope of the gas fuel department.

We cannot but feel that each of you recognizes the full importance of these accomplishments that have distinctly revolutionized and wonderfully expanded what heretofore has been a narrowed field of operation, in so far as manufactured gas was applied, to heating water for the purpose in the sense of utility, comfort and convenience.

It might not be amiss to state that the field in which these devices are being operated is still incomplete, and that the further refinement of the product, and the developing and broadening of its application, are in a constant process of evolution, and it is our hope that, with your same helping hand, which has assisted heretofore in the fruition of these ideas and their application, may be enjoyed in the future.

I will mention a few of the fields in which these heaters are being employed that are not generally known, and which will show you what a wonderful help they are toward opening avenues heretofore closed to the gas companies:

1. Superheating steam to increase temperature without increasing pressure in the rolls of the textile mills in Philadelphia.
2. Keeping steam in the boilers of fire engines which are lying idle in the fire houses.
3. Pasteurizing wine.
4. Cooking sherry wine.
5. Furnishing hot water for curing barrels in barrel factories.
6. Heating swimming pools.
7. Sterilizing beer.
8. Where large quantities of hot water are required for manufacturers' use as soon as work begins, in the morning, and at the same time to be able to do away with a night engineer.

Corporation Regulation.

[Prepared by Mr. John A. Britton, for the Santa Cruz Convention, Pacific Coast Gas Association.]

The position occupied by public service corporations in the mind of the public is not, as may be first believed, so much due to the attitude of the daily press as it is to the original sins of the corporations themselves, which were, it must be confessed, in many instances equivalent to the action of get-rich-quick concerns, and which gave the opportunity and excuse for the present attitude of the press.

The daily press has, because of the license allotted it under the guarantee of our Constitution, become not alone a censor for the public, but occasionally a misleader of public opinion. It attempts, and very often succeeds, in becoming prosecutor, judge and jury, trying a case on misstatement of facts and rendering a verdict according to its personally distorted views, either for self-aggrandizement or to curry favor with certain political interests inimical to corporations. It will rarely, except in its advertising columns for pay, give the corporation side of any argument, and the public is for 365 days in each year treated to a one-sided dissertation on the graft and greed of corporations and their managers, who are held up to ridicule and scorn by the facile pens of the editor and reporter and the equally graphic pen of the cartoonist. For all of this pilloried condition the present corporations, and their predecessors in interest, have themselves so largely to blame that a new method of treating the public must be created to restore them to the favor in which they were once held.

Less than half a century ago public service corporations were regarded as the saviors of their country. Then they were few in number and largely were controlled by the people themselves, who found in them means of husbanding their surplus resources, and of adding thereto by the natural accretions of a business which was permitted to realize the same profit that all other industries were permitted to do, without let or hindrance.

As pioneers of enterprises intended primarily for the public good and welfare of communities, they were accorded privileges in accordance with their importance, and their managerial heads were men of honor and importance in the community, sharing in high civic honors and positions of prominence in municipal affairs. Their rates charged were not questioned, and, as became a legitimate industry, were reduced as the broadening of their fields produced new inventions and appliances to cheapen their product. Then, as the wealth and population of the country increased and the enterprise of serving the public became more and more profitable, it incited others to enter a field who, too timid to make the initial venture, were not too bold to become imitators and competitors, and a surfeit necessarily arose, especially in the plants of gas and electric industries. Competition, harsh, cruel and detrimental, to capital invested, and equally so to the public, by the giving of rates which yielded no profit to the giver, forced consolidation, and thus was committed some of the original sins, against which have grown others from time to time as fungus to the sturdy oak, throttling growth and killing enterprise. All of these sins have made possible the popular, administrative and executive attacks, and as by the aggregate name of corporation are classed all, the innocent must with the guilty bear the burden of public defiance and contumely.

Here in the State of California, golden in her promises even to corporations prior to 1879, reaction thus commenced against one corporation, because of fancied wrongs, but mainly because of a jealousy of the rapidly acquired wealth of a few hardy pioneers, who dared to do what others would not even attempt, and a new constitution was born and bred on the "sand-lots" of San Francisco, nurtured in the lap of anarchy and obtained sustenance at the breast of socialism, but, after being brushed into shape by conservative men, was adopted as the Magna Charta of this State, and in a few years thereafter there was exercised under it the first regulation of water, gas and electric rates. The particular provision in the Constitution, relating to gas and electric rates, and adopted in 1884, reads as follows:

"In any city where there are no public works owned and controlled by the municipality for supplying the same with water or artificial light, any individual, or any company duly incorporated for such purpose under and by authority of the laws of this State, shall, under the direction of the Superintendent of Streets, or other officer in control thereof, and under such general regulations as the municipality

may prescribe for damages and indemnity for damages, have the privilege of using public streets and thoroughfares thereof, and of laying down pipes and conduits therein, and connections therewith, so far as may be necessary for introducing into and supplying such city and its inhabitants either with gas light or other illuminating light, or with fresh water for domestic and all other purposes, upon the condition that the municipal government shall have the right to regulate the charges thereof."

From this section you will observe the power given to municipal bodies to regulate our industry—a power of absorption, or of confiscation, or, haply, of a higher and greater use, that of increase of value of properties involved. It commits to the hands of men, elected by the people to hold office for a brief period of days, judicial authority to be exercised over properties amounting to millions, puts it in their power to create or destroy, forces finally the issues involved into endless litigation, creates distrust in the minds of the people, gives the press an opportunity to inflame the minds of the public, and accomplishes in the end nothing. What, let me ask, can a body of men chosen from the masses know in the generally farcical investigations made of the detail of a business that calls for the highest skill in finance and engineering? Can 2 hours a day for 3 days solve these grave questions? Can the legislator come to the trial of this case in an unbiased frame of mind? Does he not owe allegiance more to the constituency which he represents than to the company whose case he is trying? Does he not regard with fearsome awe the clamor of the press, not to heed the vaporings of the corporation, which is trying to rob the people, but to cut their prices and their profits? Does not all of this place him in the attitude, perhaps unwittingly, of a prejudiced juror, so that his verdict, intended to be obviously fair, becomes a weird, distorted one, recreant to the truth of the facts brought out? It is not asking too much of that citizen, who, for a meager compensation, must give his time from his own affairs, to consider, carefully and judicially, such grave questions as involve the welfare of millions of other people's money. Therefore, a remedy for this very inequitable method of dealing with these properties must be evolved, and the purpose of this paper is to suggest some way of accomplishing this object.

The day has gone into the night of darkness when reasonable, farseeing and deep thinking corporation men object to the proper regulation of corporations. Regulation is needed for protection, for without it each corporation would be at the mercy of as pitiless a pack of howling destroyers as would the lonely traveler on the Siberian steppes be against the gaunt and hungry wolves. Aggregations of wealth centralized become too great a power for evil to be permitted to exercise their own prerogatives, they need the same directing hand that a turbulent, sturdy boy needs as he grows to manhood to direct into proper paths, so that his growing strength may be made of the greatest good.

The law makers of our country, confronted in the short terms of their office with great problems of State, have neither time, patience nor opportunity to legislate for such control as is needed, but should only be empowered to delegate to an executive body, specially organized for that purpose, such regulation and control after a calm and unbiased presentment of the case as each issue becomes involved. Massachusetts, New York and Wisconsin have set the pace for California and all other States. Commissions there created have restored confidence in corporations, have restored the confidence of investors in them, have set the mark of peace on the distracted brows of the public, and have made it possible to insure an earning capacity on money invested in their midst. Mooted questions of right or wrong are settled in calm deliberation and not in political heat; the consumer has at all times a friend at court and the press is powerless to wreck its vengeance and must, of necessity, in the absence of opportunity to abuse, perforce engage in a campaign to better and uplift. Thus in these States has come for the corporation men that millenium which means rest from the incessant, latter-day trials of striving to pacify the minds of inflamed partisans.

With proper regulation of corporations will come the much hoped for demise of that unreasonable demon and destroyer, "Municipal Ownership," the product of unregulation and corporate greed, and the political charnel house in which is stored the whitening bones of constituents and hungry politicians, who, becoming holders on to the teats, milk dry the unwilling breast and who, dog-in-the-manger like, allow no others to feed.

There is needed in California a facing bravely of the existing conditions, an acknowledgment of past errors and a promise of amendment to achieve that desideratum, the creation of a Board of Regulation, which means removal of the rate question from its present domain of inefficiency and indifference to the destruction of property, and to the violation of the 14th Amendment of our National Constitution.

Corporations may be, as was Caesar's wife, above suspicion. They may cater to and endeavor to obtain the goodwill of patrons, may sell their product on just and equitable bases, may make their employees profit sharers, may spend millions in pacifying, by all these means and more, the clamor of the people, but so long as annually they must submit to, and abide by, the votes of a municipal body as to what they shall or shall not charge, so long will an unholy warfare against them be waged by the few who in this land of plenty speak for the many. Goodwill cannot be created in favor of corporations by the corporations' good deeds, for they are forever misunderstood and misconstrued, and the only remedy is to invest the power of regulation in the hands of men trained in the arts and science of the industry with no political axes to grind, and men appointed for a term of years and at a compensation sufficient to guarantee the selection or election of qualified men.

To do this in our State will require an amendment of the Constitution, taking it out of the power of municipal bodies and vesting it in a commission appointed by the Governor, not a commission of infinite powers over all kinds and characters of corporations, but one specifically to control lighting companies. Such a one as has proven thoroughly competent to serve both the public and corporations, as witness the Board of Gas and Electric Light Commissioners of Massachusetts.

Budget Handed in as the Report of the Experience Department, Pacific Coast Gas Association, Santa Cruz, Cal., Sept. 15-17.

Mr. President and Members of the Pacific Coast Gas Association: The Experience Editor herewith presents his annual round-up, and in so doing cannot refrain from congratulating this Association that so many members are present, all hale and hearty, for the annual conclave by the "sad sea waves." It is needless to remark that the past year has been a strenuous one for every gas man, and our meeting once in every twelvemonth, to exchange experiences, is not alone a medium of recreation for each and every one of us, but is a profit to those whom we represent. The responses to our request for contributions this year have not been as numerous as was anticipated, and the Editor desires herewith to thank all who have so graciously answered his appeal. The paper which will now be presented is open for your discussiou and criticism, but in so doing you are admonished to always bear in mind that little poem by Alfred Waterhouse, which runs:

"Put the hammer in the locker,
Hide the sounding board likewise;
Anyone can be a knocker,
Anyone can criticize.

Cultivate a manner winning,
Though it hurts your face to smile,
And seems awkward in beginning;
Be a booster for a while."

The following experience of much interest we have chosen to title:

Electrolysis the Toreador of the Gas Main.—Investigation for a bad gas leak resulted in finding that electrolysis had attacked our distributing system. This occurred on a small service pipe and on an 8-inch, wrought iron, high pressure gas main. The service pipe had to be replaced; also the 8-inch high pressure gas pipe. Careful tests were made to determine the relationship between the gas pipe and water pipes in this same street, and, after considerable investigation, the trouble was found in a gas pipe that was bonded to the railroad track. This bond consisted of a single No. 6 copper wire, bonded to the track and wrapped around the 8-inch, wrought iron gas pipe. When this bond was removed, the temporary bonds placed at the point where the pitting occurred were also removed and the entire trouble stopped.

The lesson to be drawn from this is that promiscuous bonding of the gas pipes to the railroad tracks or water mains should be discouraged, and no bonding should be done until a careful study had been made of the existing conditions. In this case the track was positive to the gas pipe, and the current there flowed from the track to the gas pipe, which current was obliged to leave the pipe at some other point, which in this case was where the service pipe was pitted out and the 8-inch pipe destroyed. In general it is not desirable, particularly in the case of the thin iron or steel pipe, to have same carry

current, and precaution should be taken to avoid this. In spite of this precaution, however, a small amount of leakage current may enter this pipe, and there is no objection to a bond being provided to remove this current. This bond, however, must be placed at a point where the gas mains are positive to the foreign property to which we intend to bond.

In connection with the above we have an excellent article on:

The Prevention of Electrolysis of Underground Pipes.—In general there is no perfect method of getting rid of electrolytic action.

The best method of procedure would, therefore, be to adopt the method that will reduce the effects of the current on the pipes within a reasonable limit, without putting an unreasonable burden of expense upon the street railroad companies. First of all, good bonding of the rails is absolutely essential; second, sufficient metal in the track, or supplemental conductors, or a combination of both, should be had so as to reduce the drop in the return circuit to a very small percentage. After the above conditions have been secured the next thing to be given attention is to see that the network of tracks, such as usually found in the heart of any city, of from moderate size up to the larger ones, are properly connected to the negative bus of the generating station. In general, it would be well to run a supplemental return conductor to each and every track passing within a radius of, say, 2,000 feet from the station. The underground pipes at the nearest point to the station (negative) bus should be solidly connected to it. Concentric voltage surveys should be made, beginning at some convenient point near the station, and wherever any return conductor, whether it be on supplemental return or the track rails passing over the underground pipes, and the voltage surveys show that the pipes are positive to the return conductor, a bond should be made between the pipe and conductor. Continuing these circular voltage surveys, bonding where indications justify and constantly increasing the radius of these surveys, a point will soon be reached where the voltage readings will be extremely low, where further bonding of pipes to rail would not be justified. It would be well to take readings at the various points of bonding between the pipes and the return conductors from time to time to determine their permanence, or any change that may have been brought about by the extension of either the piping or street railway system in the proximity of each other, and if indications show it be necessary additional bonds between the pipe and the return conductors be installed. The laying out and the installation of the above mentioned system of reducing electrolytic action should be trusted only to the hands of an expert.

The following "Experience" goes to show how the gas man does things when it comes to thorough and proficient preparation for very particular and quick work:

Changing Location of a 12-Inch Main and Drip-Pot in a Limited Time.—Owing to the city building a storm drain it became necessary to lower a 12-inch, wrought iron, high pressure main for a distance of 300 feet, and to do so we were compelled to change a 60-gallon, cast iron, flanged drip-pot, weighing 2,000 pounds, to a point 150 feet from the location it then occupied. As this line is used to fill a 5,000,000 cubic foot storage holder, and also to supply a large high pressure district, the job had to be done in a limited time, and much depended upon our preliminary work.

After uncovering the pipe for the required distance and cribbing the ditch, it being 7 feet deep and in sandy soil, we supported the pipe in its original position by means of chain blocks and slings, and excavated under the main, as at one point it had to be lowered 3 feet. When everything was ready we closed the gate valves, unbolted the flanges on the drip-pot and raised it out of the ditch, removed the flanges from the main, split a coupling at the point where the drip-pot was to be relocated, then lowered the main and, with the chain blocks, pulled the entire disconnected main (150 feet of 12-inch pipe) along in the ditch, so as to fill the gap caused by the removal of the drip-pot, thus leaving a gap in the new location. The pot was then lowered in place, flanges were put on main and bolted to drip-pot, and the other end connected with a special sleeve. This work was done, from the time the gates were closed until the gas was turned on again, by 7 men in 2¼ hours.

The next "Experience" relates how the "bunco man" buncoed the gas consumer, and is entitled:

The Gas Regulator that Didn't Regulate.—During the early part of the present year we were receiving complaints from many of our consumers of "No gas, weak pressure, high gas bills," etc. Following our usual custom, which is to investigate the cause for all complaints of whatever nature, one of our gas inspectors unearthed a scheme that had been very successfully worked on a large number of consumers. It was done in this manner: A few weeks prior to the advent of these complaints two men who, apparently well versed in the art of convincing the innocent and unwary housewife, who is always looking for something that will allow her to use lots of gas, and rest assured that at the end of the month the gas company would present a very small bill, were offering for sale a small device called a gas governor or regulator that was easily attachable to the gas meter and which they claimed would regulate the flow of gas to appliances; also, stating that the gas company was carrying too high a pressure which caused big gas bills. Of course, this little device was simple and inexpensive, and could be put into use so easily and quickly—the salesman explaining that in a trice he would put the device into immediate operation by attaching it to the outlet connection of the meter, without notifying the gas company, and for the very nominal sum of $2.50 upwards to $10, judging always the caliber of the prospective customer's pocketbook and the amount she would likely be induced to spend to honestly beat the gas company. The little device was installed and the busy consumer went on using gas without further worry and trouble and with visions of how small the next gas bill would look.

The device is made of brass, conical shaped, the apex of the cone having an opening about ⅛ inch in diameter. The base of the cone is flanged and has spread enough to be securely held in place when the meter connection is screwed up. Within the cone is placed an ordinary white bead, held in position by the insertion of a piece of perforated sheet brass and giving space for its rise and fall with the flow of gas. That you may more fully understand, I have for presentation a sample of the device and will pass it among you for your inspection.

The working idea of this so-called regulator, in theory at least, may be explained, thus: When the flow of gas at the appliance is shut off, the bead drops down and rests on the screen, allowing full opening at the apex of the cone. As the gas is turned on the appliance the flow of gas through the cone raises the bead, suspending it upward and closing the hole at the apex of cone, thus tending to regulate the pressure and reduce the flow of gas.

But, lo! All who were enticed into purchasing this article, were doomed to disappointment. It not only worked to effectually shut off the gas flow, but instead of diminishing the gas bills they were increased. For example: One case was brought to my attention of a consumer whose bill for a corresponding month the year previous was $2.70, but whose bill after using the gas regulator was $5.20, and the claim was that they used no more gas than was used 1 year ago. Thus, the regulator, instead of reducing the gas bills, on the contrary increased them, much to the dissatisfaction of the consumers. Of course, in a case of this kind, as in many similar cases, the poor gas company is requested to rebate the increased gas bill caused by the consumer being fully convinced that he has now found a golden opportunity to beat the gas company.

A valuable experience for those living on or near the coast is:

What Salt Water Did to Our Pump.—We had a shaft of our centrifugal pump corrode entirely through in 6 months' time. This particular piece of shaft was the tail of a 7-inch pump, the diameter of the shaft at the point where the corrosion occurred being 1¼ inches, and the balance of the shaft on the other side of the impeller was 2¼ inches. From the tail bearing to the bronze runner, a distance of 8 inches, the shaft was corroded in a taper form, starting with the diameter 1¼-inch down to ¼ of an inch where it broke right next to the runner. This, having occurred in 6 months, was a decided experience for our engineers. It was necessary to replace this shaft with a bronze one on account of the pump handling sea water.

Our next is entitled:

Sudden Expansion: What Caused it?—In our take-off pipe carbon forms. It is, of course, cleaned out regularly, and is always cleaned prior to cleaning the tar from the washbox. On one occasion after this take-off pipe had been cleaned and the carbon in it wet by means of a hose, a fire started in the carbon remaining in the pipe, and during the time of cleaning the washbox an explosion occurred which did no damage, but would have been serious for the operator had he been in front of the open pipe or doors of the washbox. The opening into the washbox was stopped with a damper, and on top of

this damper was piled about 1 foot of wet lampblack. Just how gas got back from the washer through this damper and lampblack to a small fire that started in the off-take pipe, is still a mystery to the operator, as he goes through this same operation quite often and has not had but the one explosion.

Last, we have this interesting and valuable experience, showing how by-products may be handled:

Drying Carbon Fuel Brick Quickly.—During the present summer we suddenly found it necessary to have on hand a certain number of carbon fuel bricks, containing not over 10 per cent. of moisture, for a test. This was the stipulation under a contract which it was necessary either to strictly comply with or leave a loophole for the contractors to escape.

It should be borne in mind that carbon, pressed in a brick press in the form of fuel bricks, must contain at least 20 per cent. of moisture as a binder, and pressing the bricks does not reduce the moisture to any appreciable extent. Of course, we could dry the material to almost any degree before pressing it, but it must contain at least 20 per cent. of moisture at the time of pressing in order to hold the brick together. Our time was very limited, and we had to have a certain number of bricks containing not over 10 per cent. of moisture on hand by a certain date, in order to comply with the contract. We were certainly in a predicament. Although we had a large quantity of bricks on hand, we had no way to dry them except by the sun, and as they had been made within a few weeks there was not much chance that the sun had dried them over 1 or 2 per cent. At last we hit upon a scheme which not only reduced the moisture to less than 10 per cent., but did it in ample time for us to keep within contract requirements. Laying the bricks, in the shape of a baker's oven, in stacks about 17 feet long by 10 feet wide, by 7 feet high, with a dividing wall cutting their width exactly in half, we placed a door on each side of the dividing wall, supported by a casement of firebrick, with a piece of angle iron laid across the top to strengthen it. We then lit carbon fires inside the space, with the aid of kindling, and let the fire burn until test showed that the bricks were within the limit of moisture required. At the end of 10 days the bricks had been reduced to 5 per cent. of moisture. Each pile contained about 5 tons of brick and the drying of the contract amount was a matter of necessary space only. We had our bricks dried before the time they were required for the test and within the limit of the contract.

The final one has to do with:

A Puncture Caused by a Steam Road Roller.—Saturday afternoon, September 5th, the writer was very slightly shocked on receiving word that a high pressure gas main under his charge, running along the County Road and supplying a town of some 6,000 people, had been broken off by a steam roller. Upon communicating by telephone with the station having control of the pressure, he was relieved to learn that the gauge on the damaged line registered about the usual pressure. This was somewhat surprising, but good news, yet no time was lost in getting to the point of reported trouble, 10 miles away, which distance was covered in a small, single-seated auto, carrying 3 persons, in 25 minutes.

Arriving on the scene we found the head foreman of the electric department on guard, and quite the master of the situation. Happening along, just a few minutes after the accident, his attention was attracted by a noise resembling escaping steam. Seeing the roller ahead he paid no further attention until it was overhauled and noted to be quiet and motionless. Thereupon he retraced his steps to investigate and learned that our good gas was being wasted in no small quantities, coming from two holes in the ground 2 or 3 inches in diameter. Realizing at once that the long, steel spikes in the side wheels of the roller had punctured the gas main, he arranged for word to be sent to the station and then set about to stop the flow of gas—no easy task under 60 pounds pressure. Sharpening a stick about 18 inches long, and about the diameter of the spikes, effort was made to force same into the hole in the main, but the escaping gas, being deflected against the sides of the hole in the ground made by the spike, expelled the loose earth in large quantities and retreat was made. A much longer stick was then secured and this time successfully forced into the opening. In this manner both punctures were very well closed.

The punctures were found to be about ¼ inch in diameter, and were permanently closed by the use of sheet lead and saddles, which were made ready on the pipe and slipped quickly over the puncture as the sticks were removed, and then made tight. While these repairs were being made the pressure was lowered to 10 pounds for 20 minutes. It is needless to add that the main was at once lowered to make it again 2 feet below the surface of the highway, and we hope out of danger from future road improvements.

Tar Distilling in Medium Sized Gas Works.[1]

[A paper read by MR. JOHN YOUNG, Hull, England, before the Eastern Counties Gas Managers' Association, Sept. 24.]

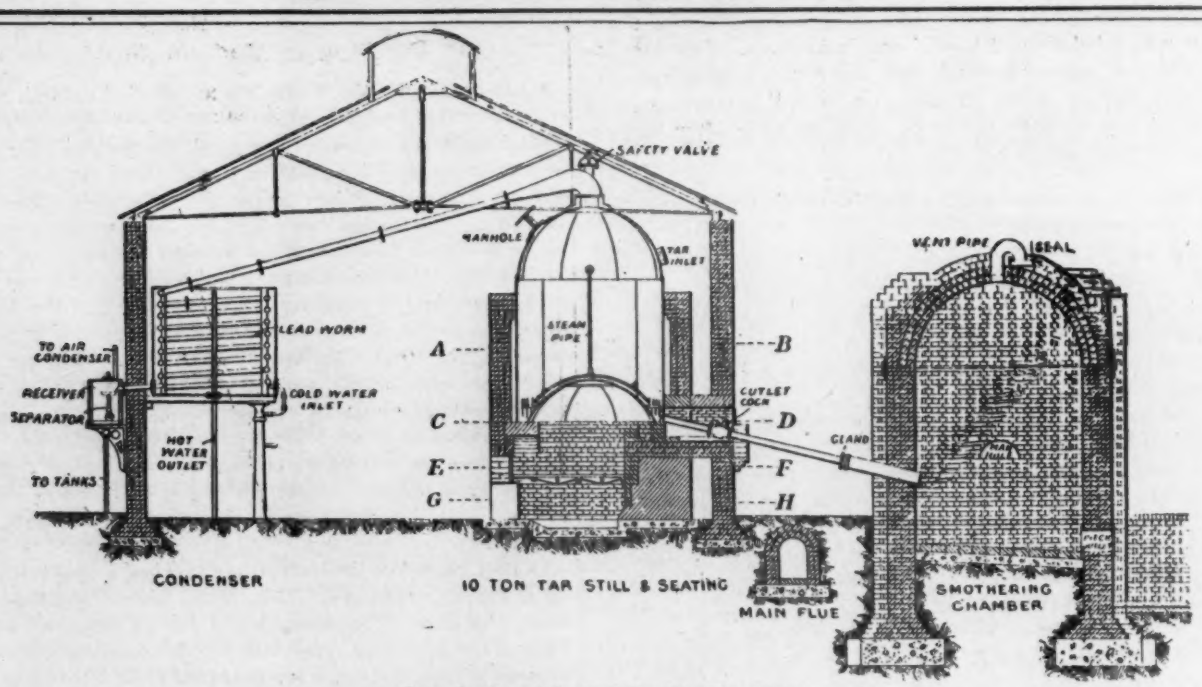
As long as prices for tar are good, the gas engineer is well content to "take the good the gods have sent" and think kindly thoughts of the tar distiller. When prices go down, down, down, as they have been doing for the last few years, the gas engineer is inclined to think, and sometimes to speak, disparagingly of the moral rectitude of the tar distiller. He also thinks in a gloomy kind of way about burning his tar for fuel or erecting plant to distill it. The mere fact, however, that prices of tar products are so exceedingly low, is sufficient to deter him from this latter alternative. Yet, paradoxical as it may seem, that is the very time to consider whether it is better to pay carriage on the raw material or distil and endeavor to realize as fair prices as possible on the resultant products; for there is no doubt there are numerous cases where the cost of carriage from the gas works to the tar distiller's works is sufficient to warrant the erection of small plant and the distillation of the tar on the site of its production.

It may therefore be interesting to give a short description of the tar distilling works at the British Gas Light Company's Hull station. The stills, five in number, are 8 feet in diameter by 12 feet high. They are of the usual type, with crown bottom and dome top. It will be noticed that the dome top is higher than is usually adopted. We have found that increasing the height of the dome tends to better and easier working. The stills should be constructed of wrought iron. The tendency of to-day is to substitute mild steel for almost all positions in which wrought iron was at one time used; but I would warn anyone against this practice in cases where the material is liable to severe corrosion. Mild steel corrodes very much more rapidly than wrought iron. Even in steam boilers I would strongly recommend a return to wrought iron. It will be noticed that the bottom of the still is made in accordance with the usual practice; but my next new stills will be differently constructed. The bottom of the side sheets will be turned inwards to form the gutter, and the bottom plates will be riveted on to this flange. This arrangement will not only give more room for expansion and contraction, but will also enable us to remove the whole of the bottom, when repairs are necessary, without interfering to any great extent with the brickwork.

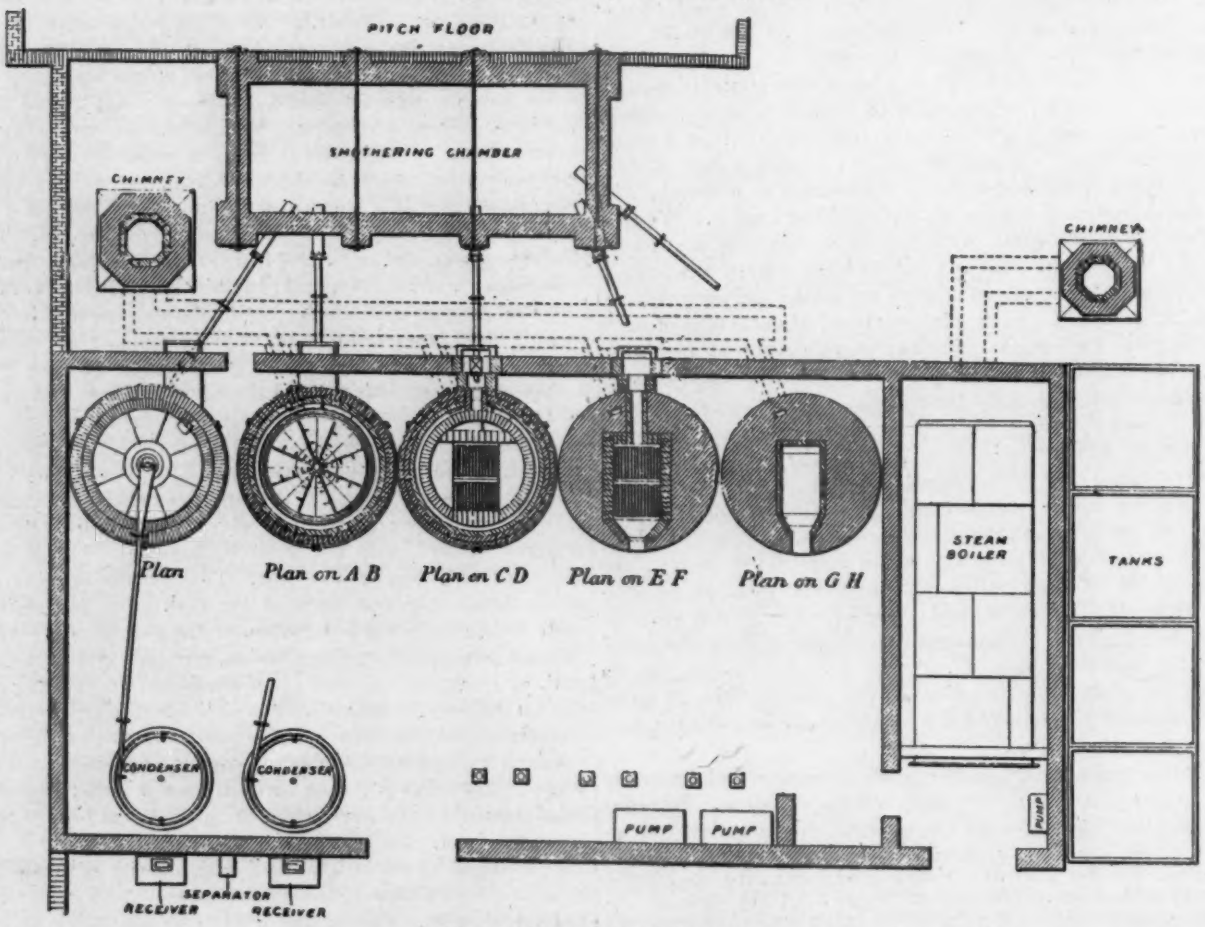
The still is set with a slight tilt backwards, so that the lowest point of the bottom is the blow-off pipe. This insures the whole of the contents being run out when the still is emptied. The method of setting the still is shown on the drawings. The plan on the line *GH* shows the ash pit, on the line *EF* the arrangement of fire bars, on the line *CD* the brickwork ready to receive the still, on the line *AB* the interior of the still with the steam umbrella fixed, and shows the heat chamber surrounding the still. The remaining plan shows the top of the brickwork and dome of the still. The heat of the fire is kept well up into the crowned bottom of the still by a bridge of firebrick. The hot gases pass over this bridge, circulate round the outside of the still, and eventually reach the main flue after having completely encircled the body of the still. A small opening in the firebrick bridge directly under the blow-off pipe permits sufficient heat to permeate the sand with which the blow-off cock is surrounded to keep it always warm. The blow-off cock is built into a small chamber, which is filled with dry sand kept warm by the radiated heat of the fire, as before explained.

The interior of the still is fitted with a series of steam jets arranged in a similar manner to the device patented by Messrs. Trewby and Fenner in 1879. The still is fitted with a safety valve of the dead weight pattern, and it also has manhole similar in design to the usual steam boiler manhole. The still head pipe is of cast iron, and is connected by wrought iron tubing to the condenser, which consists of a lead worm immersed in water contained in a cast iron cylinder. The wrought iron tubing suffers considerably from corrosion, particularly at the joints. In making these joints, our practice is to use cast iron flanges through which the wrought iron tubes are screwed, and the whole is faced up in a lathe. The joint thus made lasts considerably longer than any other we have tried, as there is no cavity where corrosive liquids can lodge. The blow-off cock is connected to the smothering chamber by flange and spigot pieces, the spigot end of which works in a stuffing box and gland, as shown. This enables us to disconnect quite easily, and no still is ever opened until it has been disconnected from the smothering chamber. This is done, of course, to insure the absolute safety of any workman who may enter

1. *Journal of Gas Lighting.*



Cross Section of the Hull Tar-Distilling Plant.



Plan of the Hull Tar-Distilling Plant.

the still when not in use. The best modern practice, however, is to have a combination of two stills—one slightly larger than the other; the larger one being placed at a higher level than the smaller. The large still is filled with cold tar and contains a condensing worm. The distillate from the lower is passed through this worm, thus making the larger still into a condenser, the contents of which are gradually heated until all the ammoniacal water and naphtha have been driven off. When the distillation in the lower still is completed and the pitch run off, the contents of the upper still are immediately run into the lower one. The upper still is refilled, and the operation repeated.

By this method a saving of fuel to the extent of from 30 to 40 per cent. is effected, and the life of the stills is considerably prolonged. Expansion and contraction of both stills are not nearly so great as by the old method, and the lower still, exposed to greater heat, is preserved from the corrosive action of the ammonium compounds, as they have been expelled from the tar in the upper still. This process was invented by Ellison and Davis in 1886, and I am surprised it has not been generally adopted, especially in large tar works. I am not prepared to say that it would pay to demolish our present plant for the sake of erecting this more modern one, but in erecting new works I should certainly adopt this principle.

Our method of procedure in tar distilling is as follows: The stills are filled with tar to within a few inches of the dome. In the case of the still shown, this represents 1,975 gallons of tar. Heat is then very gently applied by means of a small coke fire. The first distillate commences to come over at a temperature of 70° C. (taken by means of a thermometer inserted in the neck of the still), and consists of a mixture of naphtha and water. Throughout this fraction until a temperature of about 107° C. is reached, great care has to be taken, as the tar is apt

prime over, or "lift" as it is called in tar distilling. To prevent accidents, a small ¼-inch hole, called the vent, is placed in the manhole cover, and until the water is practically off, this is only loosely plugged, so that a little vapor can escape in a steady stream. This is carefully watched, and at the first appearance of tar at the opening the fire has to be partly quenched by means of a hose pipe. The distillate, consisting of naphtha and water, is run into a small separator, in which the water sinks and is run off to the liquor well. The naphtha comes over at the top and is run off to the storage tank.

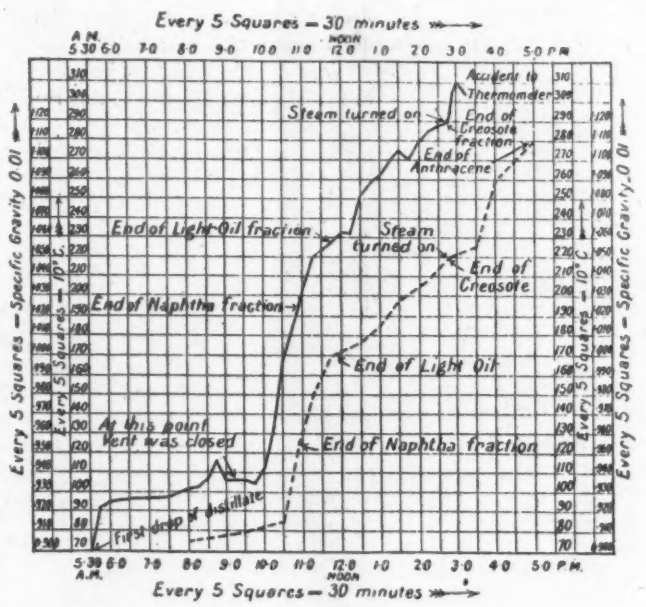
As soon as the still settles down the vent is plugged up and the fire increased. Samples of the distillate are constantly taken, and the specific gravity tested. When approaching the change from naphtha to light oil the distillate become greenish in color and the water blood red. At a temperature of about 194° C. the specific gravity rises to about .950, and at this point all water has practically disappeared and the distillate passes direct to the light oil tank. The density gradually increases until the specific gravity 1 is reached at a temperature of about 228° C. During the time naphtha is being collected, cold water is run into the condenser, the water outlet of which is kept at a temperature of 24° to 30° C. The quantity of cold water is gradually reduced as light oil is reached; the temperature of the water at the outlet of the condenser rising to about 64° C., when the change is made to creosote.

The portion of the distillate obtained between the specific gravity of 1 and 1.050 and temperatures of 228° C. and 289° C. is known as creosote. During the time the first portion of this fraction is coming off, the temperature of the condenser reaches its maximum, the outlet water being about 93°. This is to prevent the deposition of naphthaline crystals in the worm of the condenser. If allowed to cool, they would solidify and block up the pipe and cause the safety valve to blow, which, in addition to being unpleasant, is dangerous. When the creosote distillate reaches a specific gravity of 1.030, and the temperature of the still is about 270° C., the condenser water is gradually increased and the temperature of the outlet water lowered to about 60° C. at the end of the creosote fraction.

The last fraction collected is anthracene. This is reached when the distillate shows a specific gravity of 1.05 and the temperature of the still is about 289° C. At the time the change from creosote to anthracene takes place, steam has to be turned into the still. In doing this, great care is necessary to see that all condensed water is blown out of the pipes and only dry steam admitted. The anthracene fraction is driven off by means of steam, and is continued until a specific gravity of about 1.11 is reached; the quantity taken off depending upon whether a soft or a hard pitch is required, The demand at present being for medium soft pitch, our practice is to leave this portion of the anthracene oil in the pitch, as at present prices anthracene is no longer worth the cost of extraction. On the completion of the last fraction, the steam is shut off and the fire drawn, the pitch and still being allowed to cool for about 12 hours. The cock at the bottom of the still is then opened and the pitch is run into the smothering chamber, steam being at the same time forced into the still through the steam pipes at a pressure of 60 pounds per square inch. The pitch, after a furthur cooling of about 4 hours in the smothering chamber, is run off into the pitch field, where it solidifies in about 12 hours. Directly the pitch is run out of the still a fresh charge of tar is run in ready for the next working,

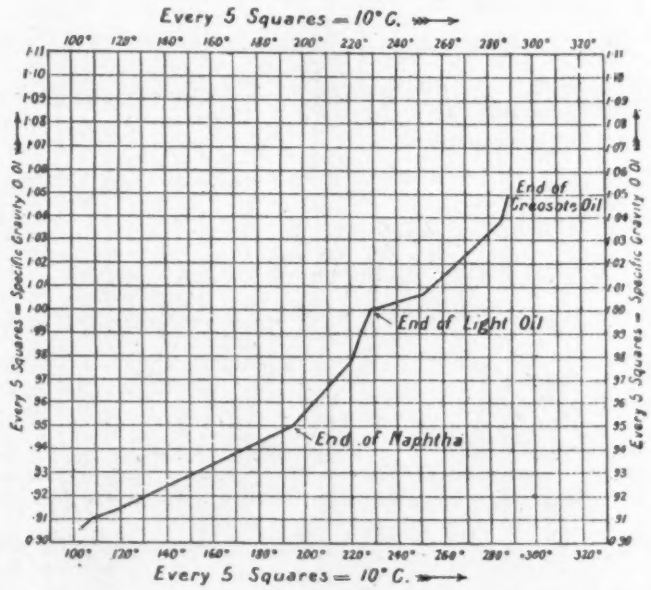
I stated that the present low price of tar is apt to make the gas engineer think disparagingly of the moral rectitude of the tar distiller. The tar distiller, as I have found him, is a hard, keen business man, but absolutely straight. In some countries a great premium seems to be placed on what is called "smartness" in business. We in England have an uglier name for it, and I am proud to think we still regard straightness as the great essential business principle. The late Peter Simpson, of Rugby, revered and loved by all who knew him, nearly at the close of his long and successful life said to me: "The true secret of success and happiness in life was enunciated long, long ago, and is contained in the few words, 'Be unto others good and true, as you would have them be to you.'" I think, on the whole, most of us endeavor to conduct our business with this great principle underlying all we do, and we must give even the tar distiller credit for at least as much good as there is in ourselves. It is, however, difficult to realize this when we note the difference in the price of tar to-day and that obtaining (say) 3 or 4 years ago. It would not be profitable to go deeply into the various causes of these fallen prices. It is sufficient to know it is beyond the power of the gas profession to alter the present depression.

The erection of installations of coking plants with apparatus for the recovery of by-products, such as the Simon-Carves, Semet-Solvay, Collin, Otto-Hilgenstock, Coppée and others, has increased the output of tar products to an enormous extent. The demand in the meantime has failed to keep pace with the production. The recovery of by-products from blast furnaces where bituminous coals are used has also tended to lower the market. The pitch obtained from blast furnaces is of inferior quality and has to be sold at a lower price, which also tends to lower the general market. Even more important is the fact that the majority of the coke ovens are carbonizing small coal upon the very collieries which a few years ago purchased pitch for making the small coal into briquettes. The result is that if 10,000 tons of small coal are carbonized, about 400 tons of tar are obtained capable of yielding 240 tons of pitch. To have manufactured the 10,000 tons of small coal into briquettes would have required 800 tons of pitch; so that by the erection of their coking ovens they not only do not require 800 tons of pitch for every 10,000 tons of small coal carbonized, but they have also produced 240 tons of pitch for their own use. Thus each installation of coking ovens, coking 10,000 tons of small coal per annum, has reduced the demand for pitch by 800 tons, and increased the supply by 240 tons per annum. These installations are being erected both on the Continent and in this country, and I believe that in some cases they are able to produce sufficient pitch for their own requirements in briquette making. The present outlook, therefore, for pitch is not very encouraging, although I believe that we have touched bottom and that we shall see in the coming year a rising tendency.


Every 5 Squares — 30 minutes
Every 5 Squares — Specific Gravity 0.01
Every 5 Squares — 10° C.
Steam turned on
End of Creosote fraction
End of Anthracene
End of Light Oil fraction
Steam turned on
End of Creosote
End of Naphtha fraction
End of Light Oil
At this point Vent was closed
End of Naphtha fraction
First drop of distillate

Curves Showing the Temperature and Specific Gravity Plotted against Time.

The full line shows the Temperature; the dotted line the Specific Gravity.



Curve Showing the Temperature Plotted against the Specific Gravity.

Tar, as we know, is an exceedingly complex mixture and varies in composition, not only because of the different grades of coal from which it is obtained, but also from the different conditions under which it is produced. The temperature of the retort, the rapidity of carbonization, and the method of removing the gaseous products from the retorts, have all an effect on the resultant tar. I give the average results of the distillation of 1,000 gallons of tar obtained from Yorkshire coals: Naphtha, 35.56 gallons; light oil, 46.47 gallons; creosote, 309.02 gallons; pitch, 3 tons 11 cwt. 3 qrs. It will be noticed that the pitch is by far the most important item of distillation, and it will therefore be understoood why the tar distiller has been compelled to reduce the price he offers for tar when it is remembered that 4 years ago pitch was selling at 55s. per ton, whereas to-day it is difficult to obtain more than 18s. a ton. It appears to me that a simple form of sliding scale might very easily be adopted by all gas works that do not distil their own tar; 1,000 gallons of the average tar produced at any works could be submitted to an independent tar distiller, and from the results obtained a scale of prices could be arranged which would be satisfactory to both the gas engineer and the tar distiller.

Under existing conditions the gas manager must sell his tar at least 1 year in advance, and there are probably heart burnings if, during that period, prices of tar products should rise. On the other hand, the tar distiller must endeavor to protect himself from a fall in prices during the same period, and if a fair and equitable scale could be arranged, it appears to me it would be mutually beneficial. Taking the distillation results I have just given you, such a sliding scale as I have suggested would work out as shown on the figures given below. This represents the value of 1,000 gallons of tar delivered into the tar distiller's works, and equals, as will be observed, 1.1d. per gallon. It would only remain therefore to deduct the cost of carriage from the gasworks to the tar distillery to arrive at the correct value of the tar at the gas works.

At present prices—

	£	s.	d.
35.56 gallons of naphtha at 3¼d. per gallon.....	0	10	4.46
46.47 " light oil at 3d. "	0	11	7.41
309.02 " creosote at 2¼d. "	3	4	4.53
3 tons. 11 cwt. 3 qrs. of pitch at 18s. per ton	3	4	6.90
	7	10	11.30
Less 2½ per cent.....	0	3	9.30
	7	7	2.00
Deduct 37½ per cent. for working expenses and profit..	2	15	2.00
	4	12	0.00

On the table Mr. Young had a collection of samples of distillates from the plant, and to these he called attention. There was first a sample of the tar distilled (specific gravity 1.193), then of naphtha (specific gravity .920), of water collected during the naphtha fraction, of water last running, of water with light oil floating on it, of light oil (specific gravity .990), of creosote (specific gravity 1.007), of creosote taken just before changing to anthracene (specific gravity 1.050), of first runnings of anthracene (specific gravity 1.055), of anthracene with green oil separating out (specific gravity 1.090), of anthracene last runnings (specific gravity 1.110) and of pitch. The room was then darkened, and Mr. Young interested the members, by the aid of a lantern, with a series of photographic views of parts and details of the tar plant at Hull.

Following this, complying with a request, he showed some slides illustrating the special work that had been done by his Company—the British Gas Light—in bringing the street lighting of Hull up to date. The modes of conversion of old lanterns, and the fittings necessary for the purpose, were thus pictorially explained. In converting street lamps it is evident Mr. Young believes in doing the thing well. He uses a new windproof top and porcelain chimney and reflector, made specially for him by a pottery firm. He employs climbing lights for igniting the burners, and the lanterns according to size are equipped with from 1 to 5 burners. An important feature is, in successful lighting, the governing of the incandescent burners, and Mr. Young's faith is revealed when he says that he uses the Peebles diaphragm pressure governor. In his case he does not allow a burner to be fitted until it is tested with this governor—that is to say, the governor and the burner are tested together, and in this way excellent success is realized. With regard to the use of indiarubber connections, formerly they were frequently found cracking from the outside, but the trouble has been cured by binding these rubber connections with indiarubber tape. The Company has not charged the corporation anything for converting the street lamps.

The Wiring and Illumination of the Hudson River Tunnels.

By N. A. Cornell, in *Elec. World.*

The lighting requirements of underground tunnels and stations demand that the illumination shall not only be ample, but also constant under any condition that may arise in the operation of the system. In the lighting of the tunnels and underground passenger stations of the Hudson and Manhattan Railway Company (familiarly known as the McAdoo Tunnels), an interesting solution of this problem is presented—not because of its complex features, but because of the simplicity and completeness of control.

The source of supply consists of two 3,000-kw., 11,000-volt, 25-cycle steam turbine units located in the main power house at Jersey City, either or both of which may be connected to the lighting busbars. From the power house switchboard the energy is conveyed through 3-conductor, paper insulated cables drawn through the tile ducts to the transformer closets at the passenger platforms.

Oil-filled, single-phase transformers located in these station closets supply 600-volt current for the lighting of platforms and adjacent portions of the tunnels. These transformers have the middle point of the secondary winding substantially grounded. Transformers rated at 25 kw. have been selected as units, there being one or more of these units at each station depending on the load attached. Connections to the primary side of the transformers are made through disconnecting switches and 11,000-volt, 4-amp. tube fuses mounted on high tension insulators and soapstone panels and barriers. The fronts of these panels are fitted with removable asbestos board doors to prevent accidental contact by workmen. Each panel contains three of these switches and fuses, and all three phases are brought to the jaw sides of the disconnecting switches. This arrangement makes it easy to balance the various transformers on the phases and also allows a shifting of the load from phase to phase should the need arise. Where the transformer closets are small, these primary panels are located opposite to the doorways so that the switches may be operated by long handles from without the compartment. A view of this primary panel outfit in place in transformer closet is shown in Fig. 2.

From the secondary side of these transformers feeders are carried in conduits under the overhang of the platforms and in the floor to the distributing centers, and where more than one unit is needed to supply the load at any station, separate feeders from each transformer are carried to the distributing center or centers. These distributing centers are placed where they will be easy of access by the station attendants; the points selected being as nearly central as possible with relation to the loads supplied. The switch and fuse control panels located at these centers are designed with a separate section for each transformer supplying such panel. Each transformer section of panel is fed through a double-pole, double-throw, quick-break knife switch on the panel, so arranged and connected that in case of trouble on any transformer or feeder supplied by it the throwing of this switch will connect the entire section affected to the contact rail. In addition to the one or more transformer sections each control panel has a section connected directly to the contact rail. A view of one of these control panels is shown in Fig. 3.

The lamps on platforms, ticket offices, passages and stairways are divided between the one or more transformer sections and the contact rail section of the distributing panels in such a way that no area will be at any time without enough illumination to enable the public easily to make their way to and from the stations; and should there be diminution of light caused by trouble on a transformer or feeder, it would be only for the short time necessary for an attendant to throw the switch on the distributing panel.

Branch conduits are substantially grounded and are installed concealed in the floors, walls and ceiling of platforms. Most of these ceiling tubes and outlet boxes were put in over the wood forms and the concrete arches cast around them, thus obviating any weakening of the arch due to cutting after the concrete had set. In the tunnels conduits are run exposed. Galvanized straps and expansion bolts are used for securing the conduits in the concrete sections of the tunnels. In the cast iron ring section of the tunnels, the conduits are held in place by galvanized strips of various lengths (and with punched ends),

one end being secured back of a lock-n ut on one of the bolts holding the cast segments of the tube together, the other end being slipped over the conduit.

The conduits are placed high up on the tunnel sides at such points as to be out of the way of trains, and so that the lights in the tunnel will not shine in car windows to the annoyance of passengers. Between any two series of five lamps the conduits bend down to easily accessible junction boxes, in which are placed section fuses for the connections and control of each five lamps. This bend in the conduit also takes care of any expansion in the conduit lengths. These junction boxes provide convenient points for testing the tunnel wires and also permit temporary portable lighting connections during roadbed repairs.

Insulated wire for the system has been furnished to meet rigid specifications as to stretching, recovery and chemical tests as well as the usual voltage tests. Conductors have from $\frac{1}{16}$-inch to $\frac{1}{4}$-inch rubber walls depending upon the size of conductor, and wires are covered with substantial double braid. Lead sheathing has been omitted from all secondary wires that go in metal conduits in order to avoid any pitting of the lead that might arise either from chemical action or possible stray currents.

Platform fixtures are made of cast iron heavily plated with bronzed copper and contain clusters of five series lamps, which unit has been selected for ceiling outlets so that when one lamp of the series burns out the position of this lamp is determined and its replacement made from one point, thus saving in maintenance cost. For high ceilings, pendant balls are used for fixtures (as shown in Fig. 1) and for low

Fig. 1.—Pendant Balls in a Station.

ceilings the lower half of the same style pendant ball is used; all parts being interchangeable and requiring but few fittings kept in stock. The usual fixture insulating joint is omitted; the metal portion of the fixtures being connected to the grounded conduits and the branch circuit wires carried directly to the cluster or socket. This forms a very rigid and substantial fixture suspension and prevents the possibility of a maintenance attendant making a ground connection through his body, between the metal part of a defective fixture and the adjacent structure.

The lamps used in the tunnels and in front of platforms are placed in single sockets, five in series. Tunnel lamps are spaced 30 feet apart on alternate sides of tube and each line in any section of tube between stations may be controlled from the station platform at either end. The normal connection of these tunnel lamps is such that each platform controls one line in each tube, it being a remote possibility that feeders at both ends should give out at the same time. Tunnel lamps are fitted with enamel shields placed on the side from which trains approach, and the lamps point down, not only for ease of removal, but also that the outlet box may form a moisture shed for the lamp socket. This outlet box and lamp equipment is shown in Fig. 4.

The light intensity in the tunnels is amply sufficient for track inspection and the distribution of light in passenger stations is such that the variation in intensity on platform floor is very small. The

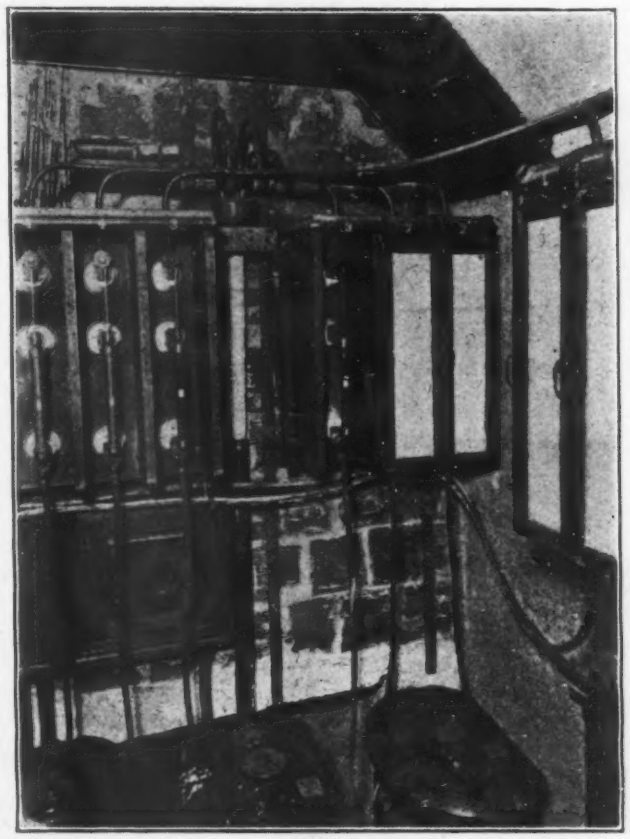


Fig. 2.—Primary Panel Outfit.

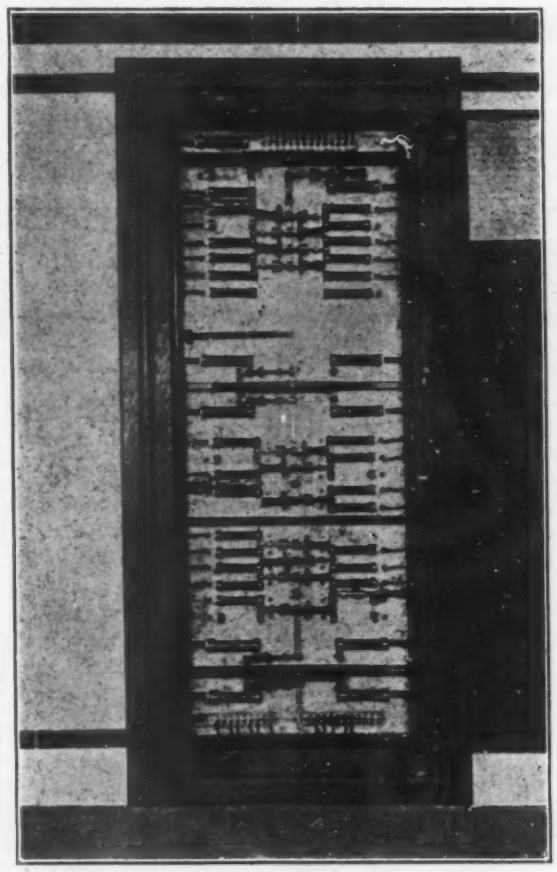


Fig. 3.—Control Panel.

globes at all platforms, except terminals, have translucent figures or letters burned in them to enable the passengers easily to read station locations even though the train be moving at considerable speed. Many attractive day and night signs are also placed at the various street entrances to the tunnels to direct traffic.

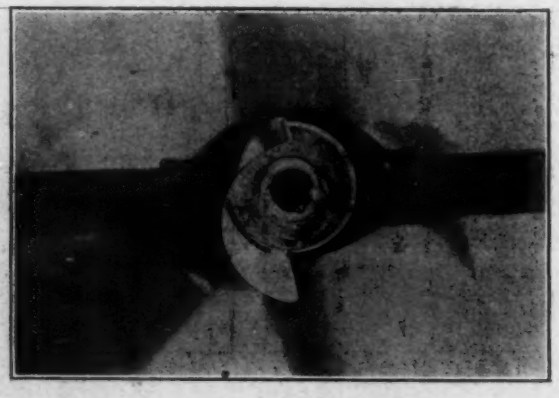


Fig. 4.—Outlet Box and Tamp Equipment.

The entire system has been designed and installed with the purpose of obtaining all the results desired at a low maintenance cost and simplicity and substantiability have been the aim throughout. The diagrammatic scheme for wiring platforms and tunnels is given in Fig. 5, and a partial view of the terminal at Hoboken is shown in Fig. 1.

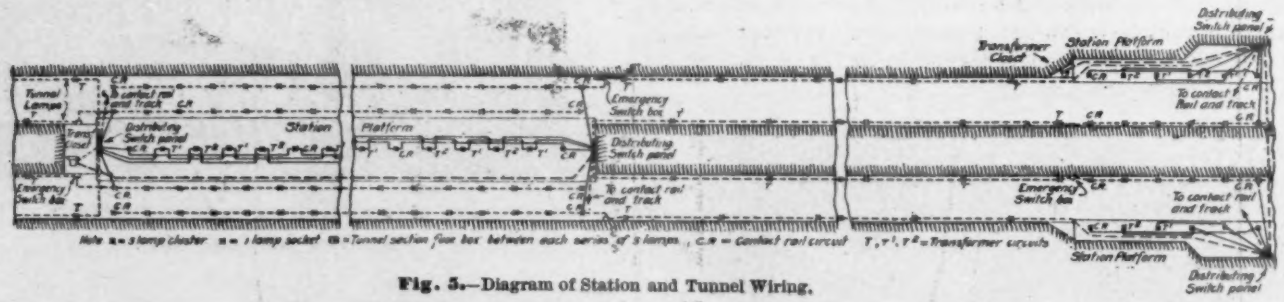


Fig. 5.—Diagram of Station and Tunnel Wiring.

The lighting equipment was installed by the Tucker Electrical Construction Company, of New York city, acting under Dr. L. B. Stillwell and Hugh Hazelton, the electrical and consulting engineers.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. O. D. MUDGETT, formerly on the staff of the Westinghouse Electric Manufacturing Company, has been appointed Assistant Superintendent of the Belfast (Me.) Gas and Electric Company.

ACCORDING to recent advices from Worcester, Mass., the joint standing Committee on Lighting of the City Councils of that city voted, some evenings ago, to recommend to the City Council that the Welsbach Lighting Company of America be awarded the contract for the lighting of the public lamps, for a period of 5 years, the contract to be as of the 1st ult. The bid figure was $25.80 per lamp per year, and the number of lamps in duty to be not less than than 500. Of course, an all night and every night table is operative in Worcester.

AS outlined by the engineers in charge of the canal reconstruction scheme at present going on in New York, the new lines going through Albion will virtually wipe out the gas and electric light plant proper in that city.

DEAR JOURNAL: I think some mention should be made by you of the decision of Justice Brown, rendered the morning of the 8th inst., in respect of the prayer of the Buffalo (N. Y.) Gas Company to have dissolved the injunction restraining it from shutting off the gas supplied on municipal account, pending the settlement of the contention over the price at which the gas is to be paid for by the city, both on backward and forward accounts. I think this mention should be made, for the decision is such a straightforward one that its findings, together with the name of its founder, should be made known to every gas man. A resume of the decision, taken from Judge Brown's memoranda respecting the case, is about like this: "From July 1, 1907, the defendant has furnished illuminating gas to the plaintiff for street and public building lighting purposes, rendering bills therefor at the rate of 95 cents per 1,000 cubic feet. The plaintiff has declined to pay such bills, contending that such gas is only worth 75 cents, and assumes the right to liquidate and pay the defendant's claim at such rate. Bills amounting to $131,658 having accumulated, the defendant notified the plaintiff that, unless such account was paid, the gas for street and public building lighting would be turned off on September 10, 1908. To restrain the defendant from turning off such gas the plaintiff brought action and secured a temporary order enjoining the defendant from such act. The defendant moves to vacate such injunction. It is very apparent that the differences between the parties cannot be settled until it is determined by an authoritative adjudication what would be a reasonable rate for the defendant to charge the plaintiff for its gas. For the gas already furnished this court has ample power to determine its value and adjudicate upon the plaintiff's present indebtedness, but the power to determine what rate may be legally charged for future gas has been lodged by the Legislature with the Public Service Commission, and that power can only be invoked by the plaintiff. The defendant is denied the right to institute any proceedings looking to the establishment of a rate for the future and the plaintiff refrains from so doing, contenting itself with using the defendant's gas, declining to pay for it and invoking the equitable power of the court to restrain the defendant from turning off the gas. With the refusal of the plaintiff to pay the rate of 95 cents fixed by the Commission, or to pay the rate of 75 cents, conceded by the plaintiff to be just, and await the determination of what is a legal rate, the plaintiff takes a position so manifestly unfair that its injunction order prohibiting the defendant from shutting off its gas cannot longer be continued. The motion is denied upon the condition that the city pay the Company within 10 days a sum equivalent to 75 cents per 1,000 cubic feet for gas used since July 1, 1907, this payment to be made without prejudice to either party to establish any other sum as the reasonable value of such gas. In the event of the failure of the city to make such payment an order may be entered at the expiration of the 10 days vacating the injunction."

THE Lamar (Col.) Gas and Electric Company, to operate in Lamar City, has been organized by Messrs. F. H. Kelsey and G. W. Adler, and Miss Cora R. Strain. It is capitalized in $50,000.

LAST week Judge Head, in the Superior Court, of Philadelphia, affirmed the action of City Court No. 2, in dismissing a suit brought by Maurice L. Bower and others, to have declared illegal the practice of the United Gas Improvement Company in imposing penalties for the non-payment of gas accounts within a directly specified time. The prompt payment time in Philadelphia is limited to 3 days, and the penalty is the loss of a 3 per cent. discount.

MR. ALBERT J. WEBER, son of the late Adam Weber, and well known to gas engineers at home and abroad, returned to New York last week, after a trip to and through Europe that covered a period of several months. During his trip he visited several of his gas engineering friends in Great Britain, France and Germany, respecting the theory, construction and operation of the vertical retort system. Mr. Weber declares that he is about to introduce a new system on the vertical plan in this country. Speaking generally over the subject Mr. Weber averred to the writer his firm belief that the vertical system in the main may be accepted as bringing about an 18 per cent. increase in the yield of gas per pound of coal, a very superior coke and much greater economy in operation and maintenance. A disagreeable feature of his journeying was a severe attack of bronchitis which beset him while in Heidelberg, but skillful physicians and patient nurses put the foe eventually to rout.

"DEAR JOURNAL: The afternoon and evening of the 9th inst., were pleasantly spent by those in the know, who assembled in the rooms of the Milwaukee (Wis.) Athletic Club on the date noted. They gathered to wish good speed to Mr. F. J. Ruttledge, who for some time has been in charge of the commercial division of the Milwaukee Gas Light Company, and whose resignation therefrom was caused by his acceptance of a similar position in the home office of the United Gas Improvement Company in Philadelphia. So that he would always know where his time was being spent his hosts presented him with a handsome gold watch. A well set up luncheon was also a pleasing incident of the affair.—P. R."

MR. GEORGE F. BUCKHOLTZ, for 4 years Superintendent of the Batavia (N. Y.) Light and Power Company (it went out of business not very long ago), has been appointed Superintendent of the Canandaigua (N. Y.) Heat, Light, Power and Gas Company, directly under the management of Mr. George L. Colgate.

MR. S. J. CHAPMAN, formerly Superintendent of the Pontiac (Ills.) Electric Light Company, on the 15th inst. assumed the duties of Superintendent of the Clinton (Ills.) Gas and Electric Company, succeeding Mr. Ira E. Price. The latter has been appointed Manager of the Newport (Ark.) Electric Light Company.

MR. A. L. MASON, writing from Muncie, Ind., under date of the 12th inst., forwards the following: "The City Council of Alexandria, Ind., has granted a franchise to the Indiana Gas and Electric Company to establish and maintain an artificial gas system there. The city is to be supplied from a central station outside of Alexandria, and the Company has furnished a bond in the sum of $5,000, to be forfeited in case it does not have the local system in operation by December 1, 1909. Gas is to be sold at a maximum rate of $1 per 1,000 cubic feet, with a discount of 10 cents per 1,000 on bills paid before the 10th of the month in which they were presented. The city is to be furnished with 400,000 feet of gas annually for public buildings free, and the cost of setting meters is to be borne by the Company, no meter deposit being required. A minimum rate of 50 cents a month to each customer will be established. All of the lines are to be laid in the alleys, except in such cases as the Council, by resolution, grants permission for the lines to cross streets."

ACCORDING to recent advices from Spokane Falls, Wash., the employees of the Spokane Falls Gas Company have organized a club, the object of which is to promote "mutual acquaintance, good fellowship and harmony" amongst the members of the different departments. So far, it has been arranged to hold regular meetings once a month, so that the educational branch of the club may be put into swing at once. Meanwhile the Company has promised to designate and furnish a room up to the needs of the new organization without charging therefor.

THE consolidation of the four public utilities of Westminster, Md., after much bargaining, has at last been completed. The succeeding corporation is to be known as the Consolidated Utilities Company, and the concerns merged formerly bore the titles: Westminster Gas Light Company, the Carroll County Electric Light and Power Company, the Westminster Water Company and the Citizens Water and Power Company, with a capitalization of $150,000. The Directors are Messrs. Frank Sharrett, R. F. Curran, George M. Park, G. R. Gehr, G. W. Albaugh, Dr. James H. Billingslea, W. T. Thomas, F. M. Parke and John H. Cunningham; President, J. H. Billingslea; Vice-President, G. M. Parke; Secretary and Treasurer, W. Carroll Shunk.

MR. SIMON P. TORNER, for many years prominent in the natural gas supply in and around the Pittsburgh (Pa.) district, died at his home in Oakland, Pa., the morning of October 5th. He was in his 77th year, and was concerned with the construction of the original pipe line laid into Pittsburgh from the Murrysville district.

AT the annual meeting of the St. Charles (Mo.) Lighting Company suitable resolutions to the memory of the late Mr. Edward Gub (a past-President of the Company) were adopted. The following officers were elected: President, I. C. Elston; Vice-President, C. C. Collier; Secretary, J. C. Condet; Treasurer, E. L. Lambert.

"M. R." sends the following, from Woonsocket, R. I., under date of the 8th inst: "The Directors of the Woonsocket Gas Company and the Woonsocket Electric Machine and Power Company, in the interest of economy and in order to better serve their customers, have decided to consolidate the business offices and to some extent the administration of the two Companies. Frank E. Holden, President of the Woonsocket Gas Company, being anxious to be relieved of the details of the Company, while retaining his position as President, will retire from its active management. Thomas Nickerson, Manager of the Electric Company, will also act as Manager of the Gas Company, and the accounting departments, so far as possible, will be merged. The Gas and Electric Companies will continue as separate organizations, but it is likely that certain departments will be practically consolidated in such a way that some economy will result. The Directors declare that the Companies will be able to furnish better service in all respects by the making of these changes."

MR. CASPER H. ROWE has resigned from the Directorates of the Cincinnati Gas and Electric Company and the Union Gas and Electric Company, of that city.

THE proprietors of the North Adams (Mass.) Gas and Electric Company have determined to extend their main system to and through the outlying town of Cheshire.

"M. T. B." sends this under date of the 12th inst.: "The petition of the Greenfield (Mass.) Gas Light Company, for permission to issue 500 shares of new stock, par value $50 each, was the subject of a hearing before the State Board of Gas and Electric Light Commissioners last Saturday, Mr. Charles N. Stoddard, representing the Company. In June of last year he said the Company was allowed to issue new stock to the amount of $25,000 and $75,000 more in bonds. Over $30,000 more than this, however, had been expended on improvements to the property. Treasurer Rossman explained that the construction work had been unusually expensive because of the fact that blasting had to be resorted to in practically all the pipe laying. The preferred stock last allowed had been sold to the old stockholders, as had also the Company's bonds. Members of the Board asked numerous questions regarding the improvements that had been made to the plant. No opposition appearing, the Board closed the hearing and will announce its decision later."

AT the annual meeting of the Baltimore Consolidated Gas, Electric Light and Power Company, the annual reports submitted showed that the Company had enjoyed a fairly prosperous year dispite the business depression. The figures showed a credit balance to income account of $635,499. The Directors elected were: Chas. Adler, Geo. Cator, C. M. Cohn, C. T. Crane, C. H. Dickey, F. A. Furst, F. H. Hambleton, T. J. Hayward, F. S. Landstreet, F. C. Latrobe, A. S. Miller, T. J. Shyrock, I. D. Warfield, F. W. Wood, W. H. Cassell, A. N. Brady, S. R. Bertron and J. B. Dennis.

THE Union Light, Heat and Power Company, in its Bellevue (Ky.) district, has announced that, commencing Jan. 1, 1909, the net gas rate there shall rule at $1.25 gross, or $1 net.

THE New Castle Light Company, of New Castle, Del., under the management of Mr. Edward Mitchell, is making great strides towards regaining the prosperity that it formerly enjoyed. One notable thing done by him was the overhauling of the main system, a work that is still going on.

THE contract for the new purifying boxes for the Houston (Tex.) Gas Light Company has been awarded to the Gas Machinery Company, of Cleveland, O. Mr. C. H. Dunbar, by his businesslike methods in managing this Texas gas property, has not only held the favor of the residents, but has also managed to earn something for the proprietors of the Company as well.

"P. W. R.," writing from Muncie, Ind., under date of the 10th inst., says: "The farmers living in the country west and north of Elwood, Ind., are jubilant over the ruling of the Supreme Court, which gives them the possession of the gas mains that underlie their farms. To make it plain, though, the decision really prevents the successors to the defunct Tipton Light, Heat and Power Company from removing the said pipes."

THE Lea syndicate of Chicago, Ills., is said to have about completed negotiations whereunder the plant of the Monroe (Wis.) Gas Company will come under its control.

THE Public Service Commission, Second District, New York, has granted the application of those interested in the Saranac Lake Gas Company for permission to construct and operate a gas plant in the village of Saranac Lake. The request for the fixing of the Company's capitalization was continued for further investigation.

THE next meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th street, New York, the evening of Tuesday, November 10. Mr. Franklin Philips, President of the Hewes & Philips Iron Works, Newark, N. J., will address the meeting on "The High Powered Rifle and Its Ammunition: Instruments of Precision." The lecture or address will be illuminated by means of lantern slides.

THE AMERICAN GAS LIGHT JOURNAL

The Market for Gas Securities.

The situation in respect of Consolidated gas remains unchanged, save as to quotations, which are well above those of a week ago—146 to 146½ at noon to-day (Friday). The Dow-Jones circular dated this noon remarks that "Consolidated gas was heavy, and is sold by tired bulls where the market will take the stock." This sentence is respectfully referred to some of the sore-headed bears who rather jolly well remember the stripping they got about a fortnight ago.

Brooklyn Union holds its own, in fact a trifle more. The Company's business during the summer was remarkably good, and the work done on its main system this summer is bearing good fruit this fall. The general market for gas shares is in better shape now than at any other time since May a year ago.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 19.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital*	*Par.*	*Bid.*	*Asked.*
Consolidated Gas Co.	$73,177,000	100	146	146¼
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	130	160
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	102
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98	104
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	86	91
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	138	140
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91¼	92
Yonkers	999,670	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1¾	2
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	63	66
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	89	90
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90¼	91
Preferred	3,026,500	100	71	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	—	—	74½	75
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100¼
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	103	103½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	—	100
Preferred	2,500,000	100	60	90
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	54	54¼
Preferred	25,000,000	100	86⅝	87¼
Montreal Gas Co., Canada	9,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	5,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	95	95¼
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105¼
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	92	—
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	2,445,000	1,000	96¾	—
Syracuse Gas Co., N. Y.	1,975,000	100	80	55
Bonds	2,047,000	1,000	102	—
Washington (D. C.) Gas Co.	2,600,000	20	387½	390
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	200	—

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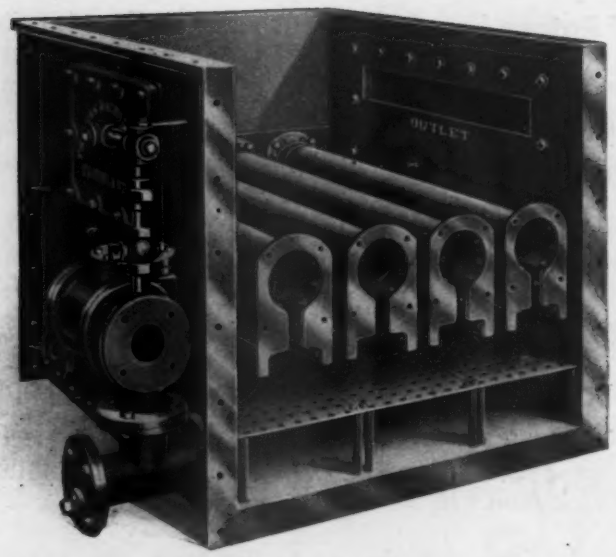

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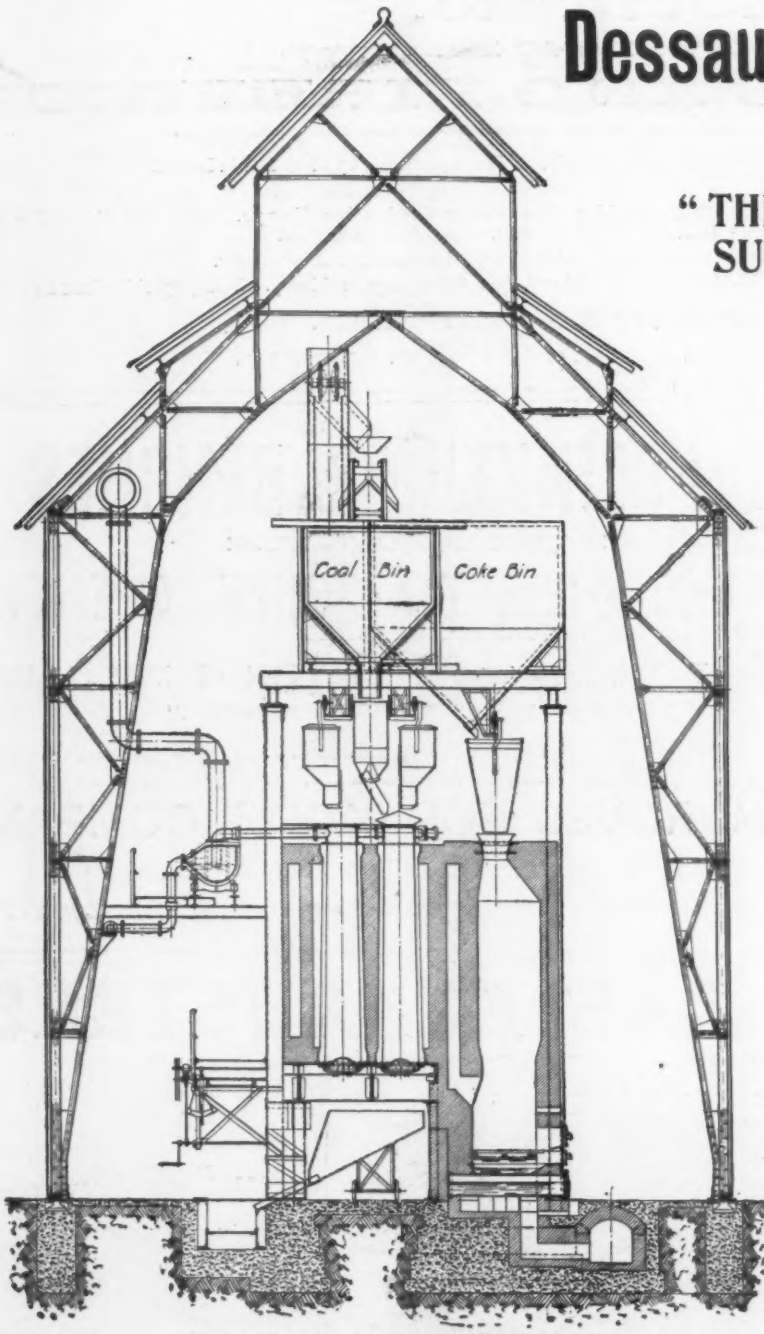

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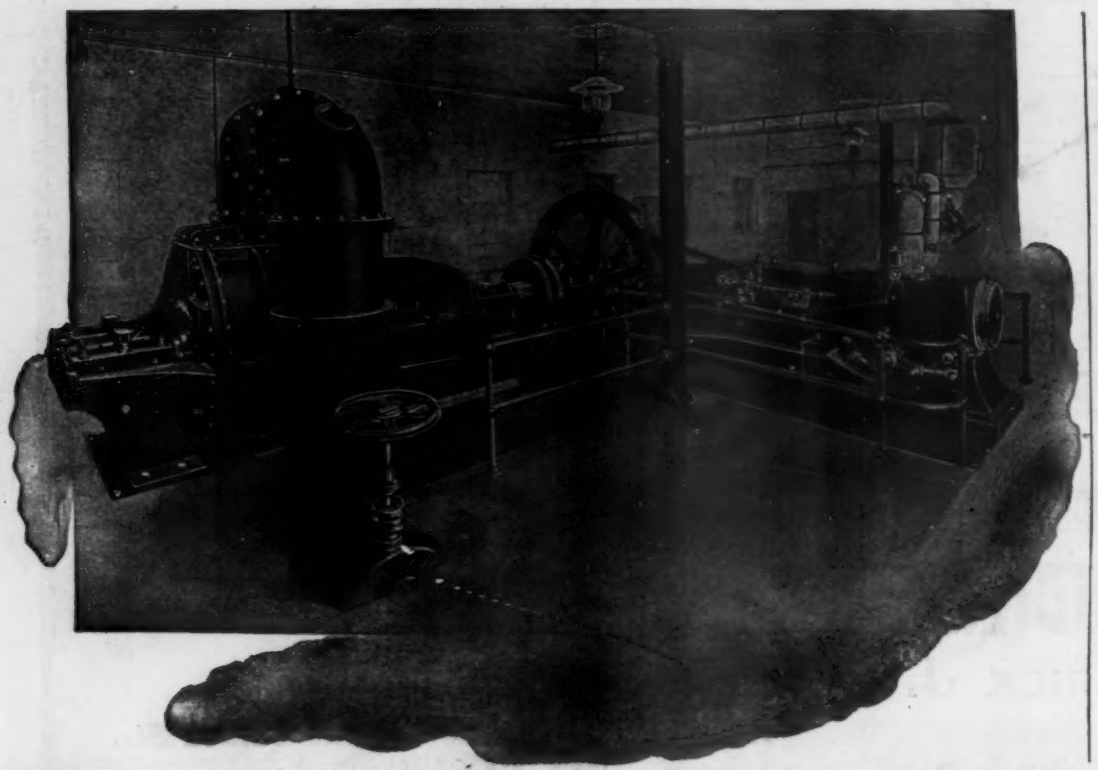

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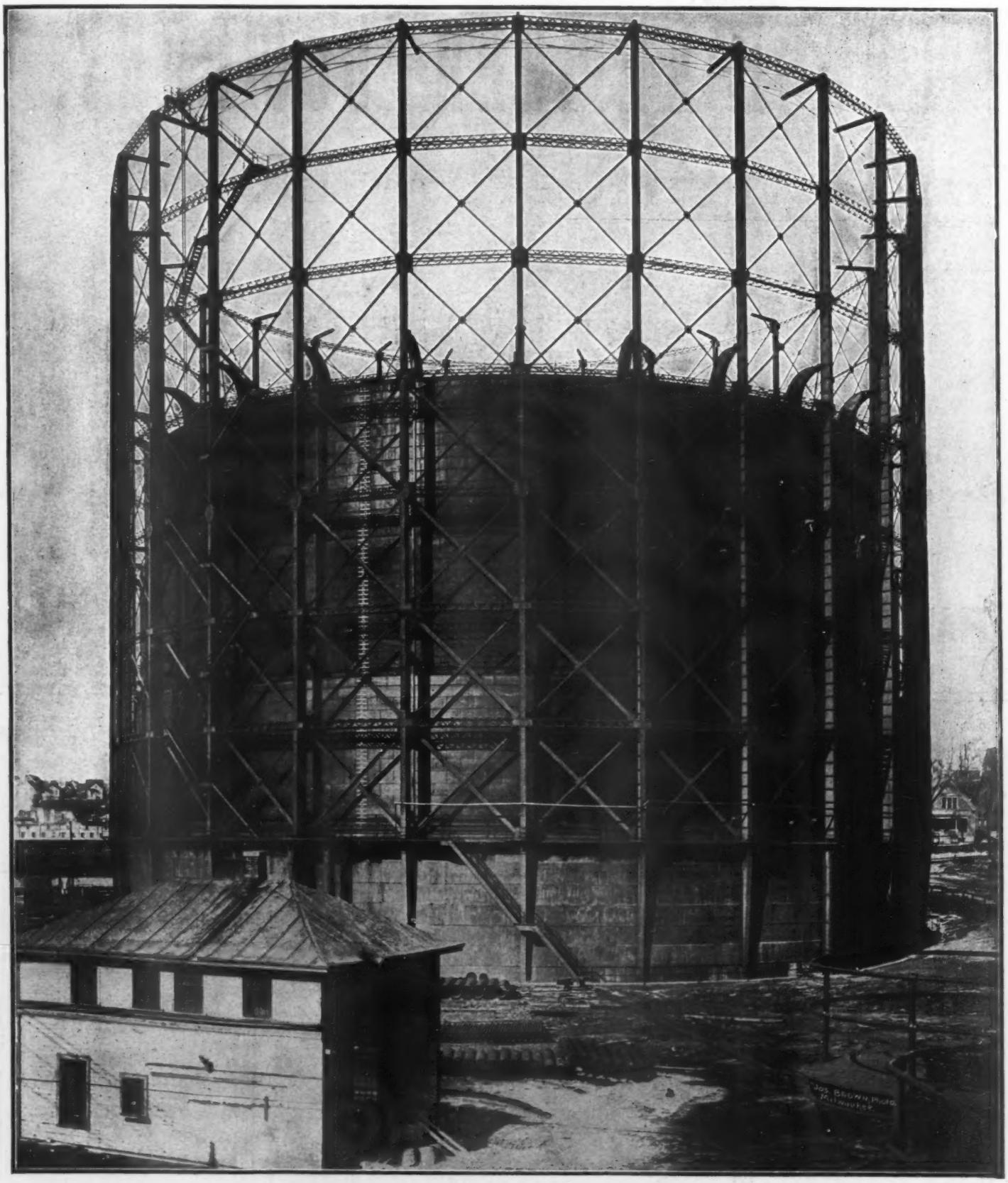

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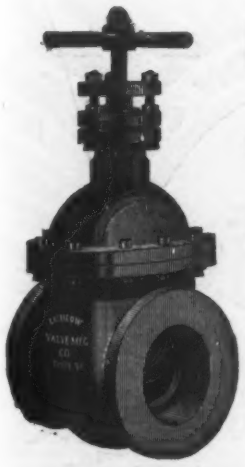

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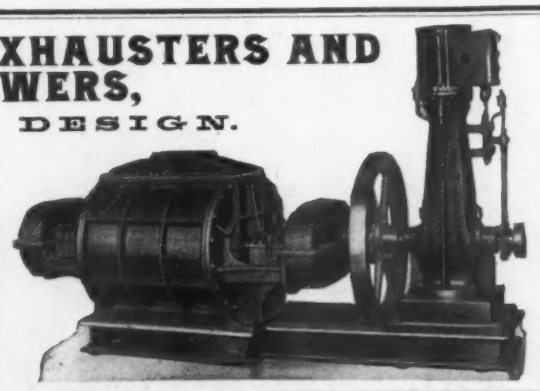

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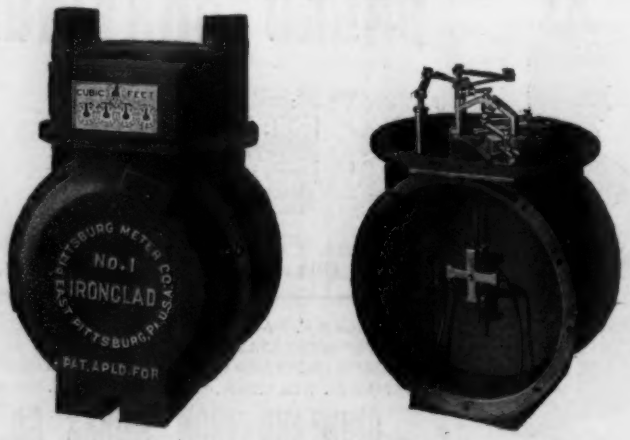

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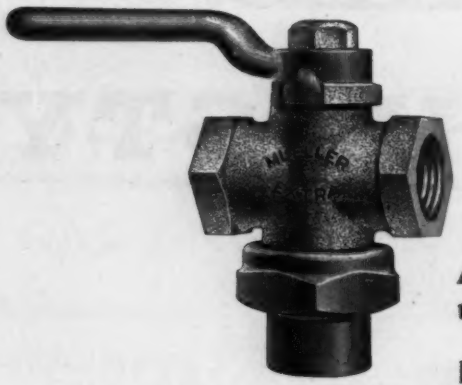

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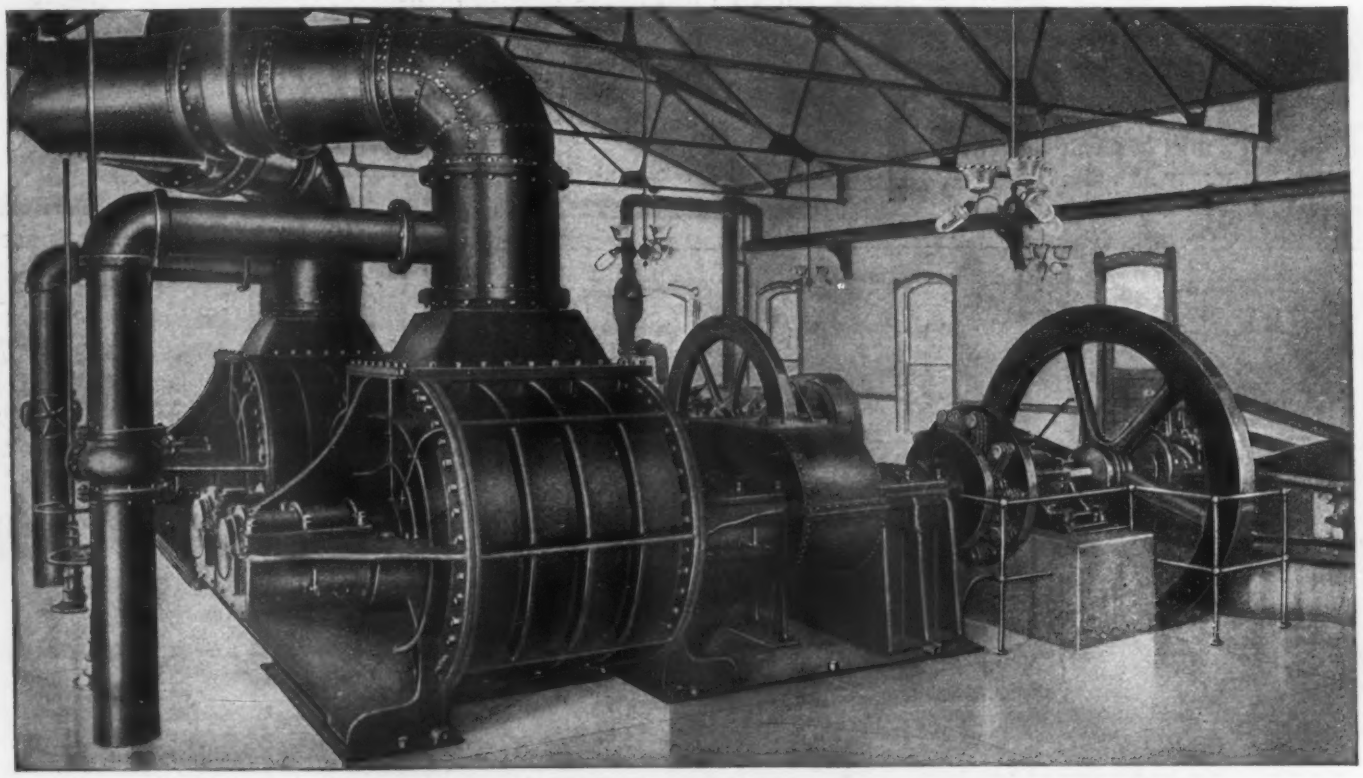

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25-Candle Power
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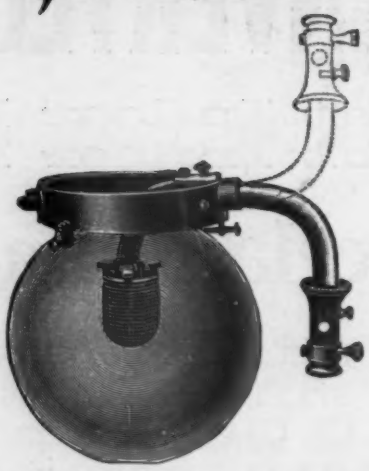

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

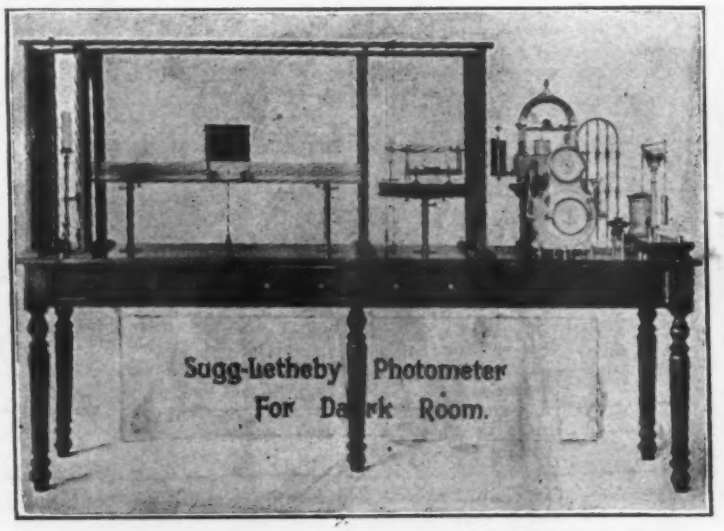
NOVEMBER, 1908.

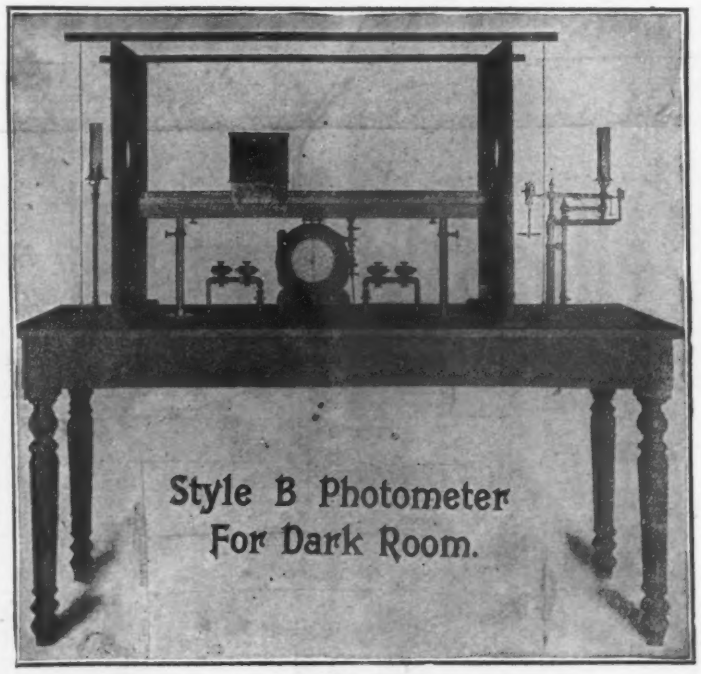
Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.
Sun.	1	10.30 PM FQ	5.30 AM
Mon.	2	11.40	5.30
Tue.	3	12.50 AM	5.30
Wed.	4	2.10	5.30
Thu.	5	3.20	5.30
Fri.	6	No L.	No L.
Sat.	7	No L. FM	No L.
Sun.	8	No L.	No L.
Mon.	9	5.20 PM	7.00 PM
Tue.	10	5.20	7.40
Wed.	11	5.20	8.30
Thu.	12	5.20	9.20
Fri.	13	5.20	10.20
Sat.	14	5.20	11.20
Sun.	15	5.10 LQ	12.20 AM
Mon.	16	5.10	1.10
Tue.	17	5.10	2.10
Wed.	18	5.10	3.10
Thu.	19	5.10	4.10
Fri.	20	5.10	5.50
Sat.	21	5.10	5.50
Sun.	22	5.10	6.00
Mon.	23	5.10 NM	6.00
Tue.	24	5.10	6.00
Wed.	25	5.10	6.00
Thu.	26	5.10	6.00
Fri.	27	5.10	6.00
Sat.	28	8.20	6.00
Sun.	29	9.30	6.00
Mon.	30	10.40 FQ	6.00

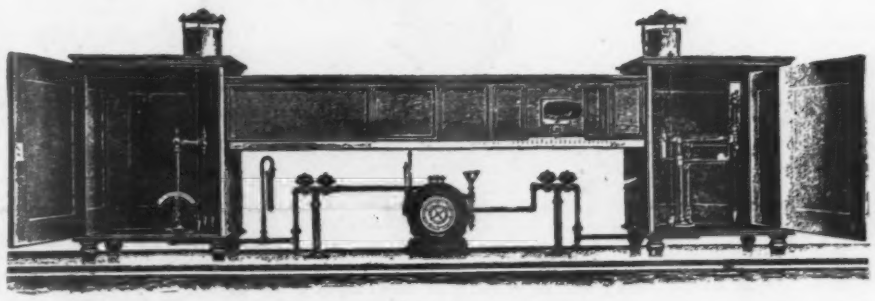
TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs. Min.
January	228.30
February	187.30
March	192.00
April	160.10
May	155.10
June	138.00
July	155.50
August	173.40
September	185.20
October	214.00
November	218.10
December	226.40
Total, yr.	2235.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

NOVEMBER, 1908.

Day of Week.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Date.	Complete Lighting in One Hour From Time Given P. M.	Complete Extinguishing in 50 Minutes From Time Given A. M.
Sun.	1	4.37	5.17
Mon.	2	4.37	5.17
Tue.	3	4.37	5.17
Wed.	4	4.37	5.17
Thu.	5	4.27	5.27
Fri.	6	4.27	5.27
Sat.	7	4.27	5.27
Sun.	8	4.27	5.27
Mon.	9	4.27	5.27
Tue.	10	4.27	5.27
Wed.	11	4.27	5.27
Thu.	12	4.17	5.32
Fri.	13	4.17	5.32
Sat.	14	4.17	5.32
Sun.	15	4.17	5.32
Mon.	16	4.17	5.32
Tue.	17	4.17	5.32
Wed.	18	4.17	5.32
Thu.	19	4.12	5.42
Fri.	20	4.12	5.42
Sat.	21	4.12	5.42
Sun.	22	4.12	5.42
Mon.	23	4.12	5.42
Tue.	24	4.12	5.42
Wed.	25	4.12	5.42
Thu.	26	4.07	5.52
Fri.	27	4.07	5.52
Sat.	28	4.07	5.52
Sun.	29	4.07	5.52
Mon.	30	4.07	5.52

TOTAL HOURS DURING 1908.

	Hrs. Min.
January	481.50
February	329.15
March	351.50
April	341.50
May	233.05
June	218.10
July	282.55
August	254.55
September	292.25
October	420.45
November	374.30
December	411.05
	3992.35
Deduct on account of 50 min. extinguishing time	30.30
Total, yr.	3962.05

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IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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For decorative appearance and large volume of light at a popular price to the consumer,

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Price, complete, clear cylinder, each, dozen lots, ... $1.35
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Mexico, Mo.
Jacksonville, Fla.
Syracuse, N. Y. (2d contract).
Atlanta, Ga. (2d contract).
Holyoke, Mass.
Peoria, Ills.
Schenectady, N. Y. (2d contract).
Danbury, Conn.
Galveston, Tex. (2d contract).
Quebec, Canada.
Indianapolis, Ind. (2d contract).
Bessemer, Ala.
Waterbury, Conn. (5th contract).
Sioux Falls, S. D. (3d contract).
Philadelphia, Pa.
New Hartford, Conn.
Poughkeepsie, N.Y. (2d contract).
Nashville, Tenn.
Salisbury, Md.
Norfolk, Va. (4th contract).
Wallingford, Conn.
Richmond, Va. (2d contract).
Oak Bluffs, Mass.
Arlington, Mass.

TOTAL SETS INSTALLED DURING YEAR, ... 43
TOTAL SETS INSTALLED TO DECEMBER 31, 1907, ... 677
TOTAL DAILY CAPACITY, TO DECEMBER 31, 1907, ... 545,865,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
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Straight Standpipe System for Coal Gas Retorts.
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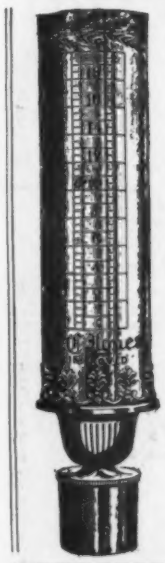

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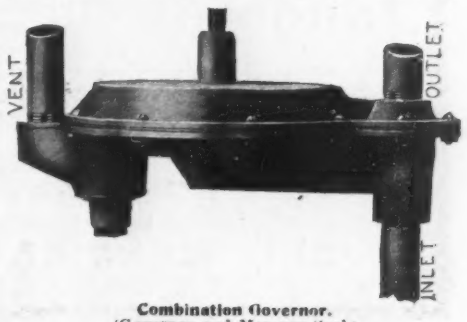

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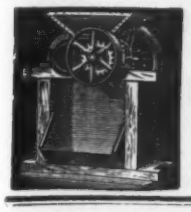

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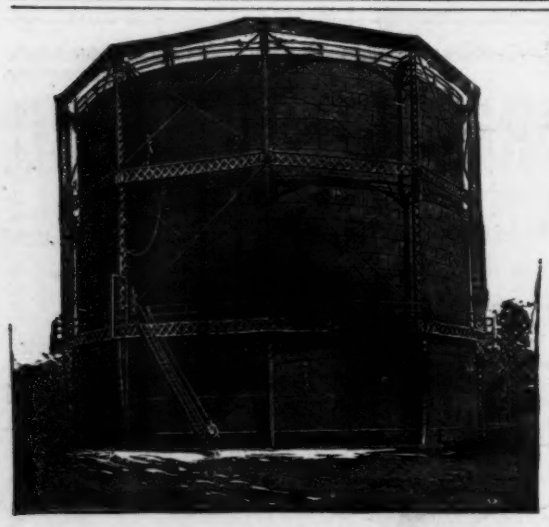

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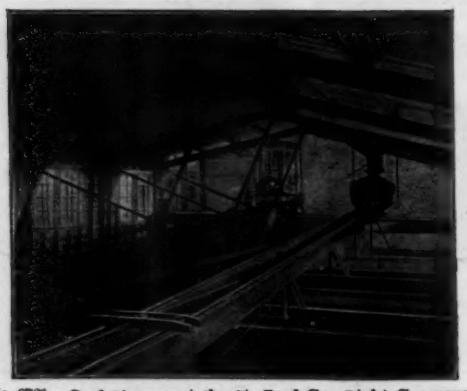

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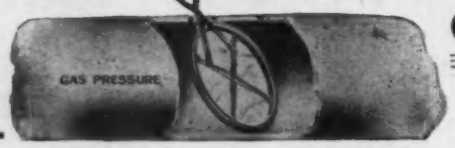

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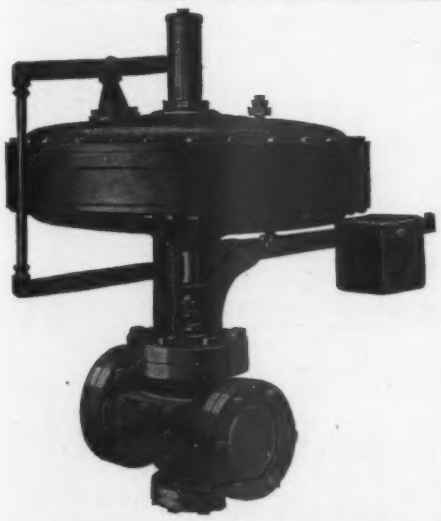

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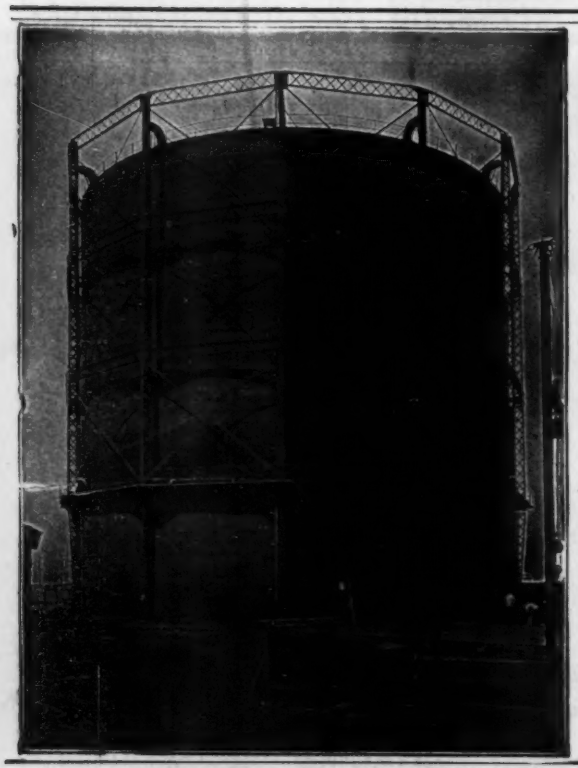

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